MAY 1971

rsc

RAILWAY SYSTEM CONTROLS

COMPUTERS: Their role in management systems

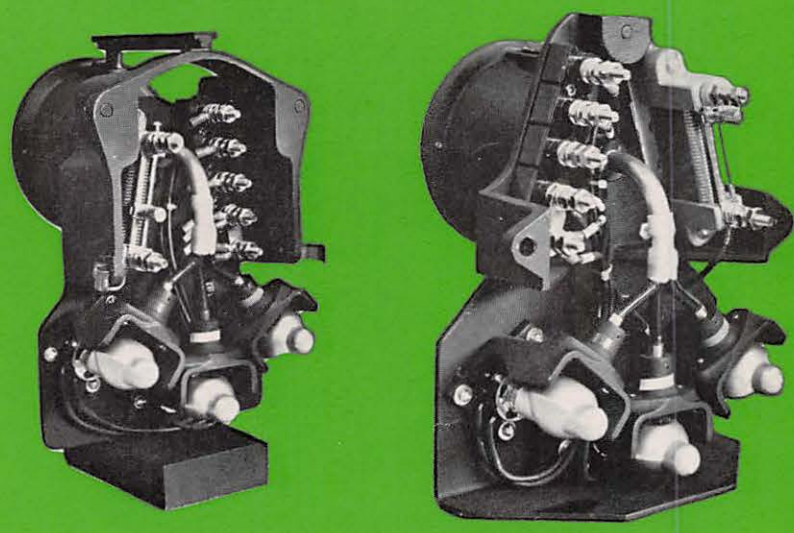
CF73 G 55
R R TAYLOR
40 WEST ROAD 60148
LOMBARD ILL

NOW FOR YOU!

RACO®
UNILENS

CONVERSION UNITS for existing SEARCHLIGHT SIGNALS

U.S. Pat. No. 3,576,563



- to provide all color indications through one lens **DEPENDABLY!**
- to fit existing housings **PERFECTLY!**

available as replacements for all current mechanism assemblies with either stepped or compound lenses.

False proceed indication due to faulty or damaged mechanism are things of the past because the RACO Unilens Conversion Unit has no moving parts . . . no mechanism . . . no need for repeating relays and associated circuitry.

When replacing searchlight type signal mechanism with the RACO Unilens Conversion Unit only minor circuit change is required because control of indications are similar to control of a multi-lens colorlight signal.

RESULT: Improved signal indication . . . at less cost . . . with far less maintenance.

MEMBER RPI RAILWAY PROGRESS INSTITUTE

Since 1920

RACO PRODUCTS ENGINEERED FOR LONG LIFE ®

Railroad Accessories Corporation

A CCI INDUSTRY

Main Office and Plant: 4650 MAIN STREET N.E., MINNEAPOLIS, MINN. 55421
Office and Plant: 7615 NATIONAL TURNPIKE, FAIRDALE, KY. 40118
Sales Office: 100 SO. WACKER DRIVE, CHICAGO, ILL. 60606

REPRESENTATIVES: Southeastern Railroad Materials Inc., 595 North Avenue N.W., Atlanta, Ga. 30318
IN CANADA: Vale Enterprises, Ltd., 1120 Claire Crescent, Lachine, Quebec
OVERSEAS: Intma International, Inc., 60 East 42nd Street, New York, N.Y. 10017

Circle 1 on reader service card

We can speak authoritatively about railroad signal cables because we have been manufacturing them since 1878. Consequently, when we say our current Okonite-Okoprene® railroad signal cable is the finest made, we can back up the statement with facts.

Sure, every railroad signal cable is built to industry specifications and standards but, and here's one of the big differences, we build them to exceed the standards.

Every component: coated conductor; the Okonite® Rubber insulation, whose excellent electrical properties have been proved in thousands of installations; the rugged corrugated bronze tapes and super tough Okoprene jacket, is a quality product that assures maximum safety in critical signal circuits.

So, for dependability and longer life for your signal circuits keep going with Okonite cables. Start by getting more information from Wire and Cable Division, The Okonite Company, Ramsey, New Jersey 07446.

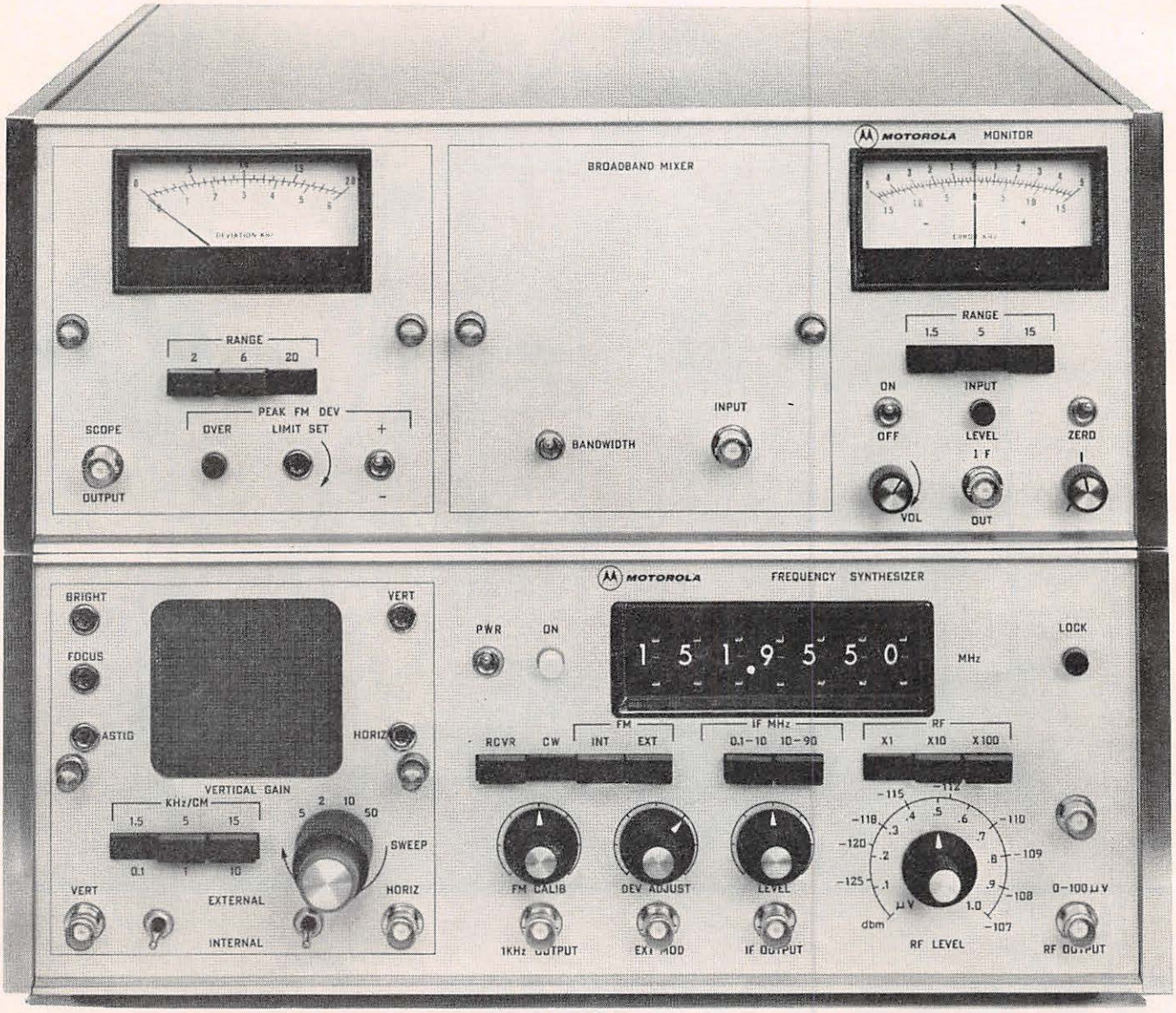
OKONITE

OK-384A-RP

KEEP GOING... with Okonite signal cable

Circle 6 on reader service card

The first total coverage, high resolution service monitor featuring plug-in modules for under $4000.



Since we pioneered much of today's FM communications technology, it's only natural for us to bring out a first in test equipment.

We took all of the functions you need for accurate, high resolution measurements and made them available at a practical price. You get everything you'd expect. Plus more.

For example, our new service monitor is designed around a plug-in building block concept. This not only lets you tailor the instrument to your specific requirements, but also provides the flexibility to prevent obsolescence. The instrument is easily up-dated by plug-in modules.

We have a six-page brochure that can answer all of your questions. For a copy, write Motorola Communications and Electronics, Department 94P, 1875 Greenleaf Avenue, Elk Grove, Illinois 60007

MOTOROLA TOTAL COMMUNICATIONS

Communications' Buyer's Guide now available by request on company letterhead.

Circle 7 on reader service card

MAY 1971 VOL. 2 NO. 5

RSC RAILWAY SYSTEM CONTROLS

FEATURED THIS MONTH:

How railroads protect their computers 12

B&H Schools offers electronic training 14

How ACI supplier helps railroads 15

MP plans operational control system 20

SCL implements operational control system 23

DEPARTMENTS:

Book: Casebook aids circuit designers 31

Editor's Corner: Signaling pays for itself 34

News Briefs 6

Product News 27

Published monthly by Simmons-Boardman Publishing Corporation, 508 Birch St., Bristol, Conn. 06010, with executive office at 350 Broadway, New York, N.Y. 10013. Second class postage paid at Bristol, Conn. 06010 and at additional mailing offices.

Member of the Audit Bureau of Circulations (A.B.C.) Name registered in U.S. Patent Office. Printed in U.S.A. by the Johnson Press, Inc., 800 North Court St., Pontiac, Ill. 61764.

© 1971 Simmons-Boardman Publishing Corporation

Member of RPI Railway Progress Institute ABC Audited Paid Circulation

supporting ASTRO

Subscriptions: Address all subscriptions and correspondence concerning them to: Circulation Department, Railway System Controls, P.O. Box 530, Bristol, Conn. 06010. Change of address should reach us three weeks in advance of the next issue date. Send old address with the new, enclosing if possible your address label. The Post Office will not forward copies unless you provide extra postage. Duplicate copies cannot be sent.

Subscription price to railroad employees only in U.S., Possessions, Canada and Mexico, $3.00 one year, $5.00 two years. All others $6.00 one year, $9.00 two years. Payable in advance and postage free. All other countries: $8.00 one year, $16.00 two years. Single copies 75¢.

POSTMASTER SEND FORM 3579 TO P.O. BOX 530, BRISTOL, CONN. 06010.

Editorial Office
29 E. Madison St., Chicago, Ill. 60602

Robert W. McKnight, Editor

Mrs. Grace Rempert, Editorial Assistant

Executive Office
350 Broadway, New York, N.Y. 10013

Robert G. Lewis, Publisher

Fred B. Hecht, Production Manager

Maurice H. Mates, Art Director

John E. Rogers, Director of Circulation

Constance Nicolai,
Manager of Contracts

ADVERTISING SALES:

New York, N.Y. 10013, 350 Broadway, Phone: 212-966-7700. W. Arthur Cubbage, Regional Sales Manager; Charles E. Keil, Regional Sales Manager.

Chicago, Ill. 60602, 29 E. Madison St., Phone: 312-641-5815. C. James Fisher, Vice-President Sales; John M. Brennan, Regional Sales Manager; William J. Lyneis, District Sales Manager.

Pittsburgh, Pa. 15234, 300 Mt. Lebanon Blvd., Phone: 412-341-0844. Ronald M. Giallonardo, Regional Sales Manager.

Dallas, Tex. 75206, Noel Page Building, 6400 North Central Expressway, Phone: 214-361-6972. Joe Sanders, Joe Sanders & Associates.

Los Angeles, Cal. 90025, 11704 Wilshire Blvd., Phone: 213-477-4004. Fred Klaner, Jr.; Philip O. Bowers, The Klaner Co.

Sausalito, Cal. 94965, 3030 Bridgeway Bldg., Phone: 415-332-1481/2. Lewis A. Vogler, Lewis A. Vogler & Co.

London, S.W.1, England, 67/68 Jermyn St., St. James's, Phone: 01-839-6318. Max F. Holsinger; Alan Berg; Kenneth J. Hendry.

Manchester 22, England, Haletop, Wythenshawe Civic Center, Phone: 061-437-3293. Ian Goulden.

Paris 8e, France, 70 Rue de Ponthieu, Phone: 359-65-77. Stephen Brown-Joussard; Jean-Claude Lamoine.

4 Dusseldorf-Rath, Eitelstrasse 32, 632031; Erich Hillerbrand; Herbert Haibt; Reinhard Schomburg; William Miller.

Tokyo, Japan, Sun Gain Shia, Ltd., Shiba Nikkatsu Bldg., 13, Shiba Park, Minato-Ku. C. H. Yiu, Managing Director.

News Briefs

PC to install CTC in Canadian project

Penn Central has awarded a contract to General Railway Signal Co. to provide equipment for the installation of centralized traffic control on two branches of the Niagara Falls Subdivision and a section of the Fort Erie Branch at Welland, Ont. These lines are being relocated due to the expansion of the Welland Canal.

A Traffic Master console, which includes NX facilities, will control ten locations on the three lines, covering a total of approximately 24 miles of track. The control console will be at St. Thomas, over 100 miles from the controlled areas. Controls and indications will be sent over voice-grade telephone lines, utilizing the high-speed system 4000 digital electronic code system.

Washington terminal to install signaling

Washington Union Terminal Co. has awarded a $2.5 million contract for the resignaling and consolidation of controls at its passenger station in Washington, D.C. to General Railway Signal Co. Trackage at the terminal is being rearranged in connection with the rail rapid transit system to be constructed by Washinton Metropolitan Area Transit Authority.

Present control facilities, now in two towers, will be replaced by an NX pushbutton, automatic route selection console, which will monitor and control all traffic in the terminal area.

GMA has four bids for terminal ACI

The General Managers Association of Chicago has received bids from four companies to provide an automatic car identification information and car control system. The system would include 109 ACI scanners and 100 decoders located at 40 key points in the Chicago terminal district.

Information from the scanners would be fed into a central computer complex from which reports would be sent to individual railroads in the district. One of the prime goals of the system would be to provide the official interchange document between railroads and also provide advance consists for the various yards in the terminal district. Savings would come about through the reduction in clerical and other labor costs, in per diem expenses and from improvements in facility utilization.

GMA had asked, at the first of this year, for proposals from manufacturers, either hardware or software firms, to cover installation of the system including scanners and computer hardware, provision for software and other programming support facilities, and operation of the system. Alternates in the proposals are to provide for the GMA setting up a subsidiary office or firm to operate the ACI control system.

The four firms supplying proposals are ACI Systems Corp., Executive Computer Systems, IBM Corp., and GTE Information Systems.

The proposals are now being evaluated by the GMA and its ACI task force with the hope that a recommendation on these four vender proposals can be made to the GMA about June 1. Subsequently, if the GMA membership accepts the recommendations and selects one of the four proposals, there is the possibility that ACI in the Chicago terminal district will be partially operational before the end of 1971.

Telepak sharing stayed by court

The decision of the FCC requiring unlimited Telpak sharing has been stayed by a U.S. Court of Appeals in New York City until the court can decide pending appeals and produce a ruling. The court had set May 6 as the date for oral arguments on the merits of the FCC verdict.

WU takes over AT&T's TWX

On April 1, Western Union Telegraph Co. took over the teletypewriter exchange service of American Telephone & Telegraph Co. WU, which paid AT&T $80 million for TWX, is planning to integrate its own Telex service with TWX into one system having 78,000 customers in the U.S., Canada and Mexico. Thus TWX and Telex customers will be able to correspond, which up to now had not been possible under separate ownership.

Also, Western Union Data Services Co., has begun offering data terminals operating under 300 baud—model 33 and 35 teleprinters—that previously had been available from AT&T under its Data-Phone service. Under the FCC ruling permitting WU to purchase AT&T's TWX, the phone company, while maintaining presently installed terminals in Data-Phone service, cannot provide additional terminals operating under 300 baud.

FCC concludes its computer inquiry

Communications common carriers will be prohibited from buying data processing services from their own affiliates, under a decision by the Federal Communications Commission in its computer inquiry. FCC said that the telephone and telegraph companies will not be able to obtain data processing services from their own affiliates or even from separate data processing subsidiaries of the parent communications common carrier. It also established that the decision as to whether hybrid services are predominantly communications or data processing will be made on a case by case basis.

Data processing unit formed by GT&E

General Telephone & Electronics Corp. has formed a new subsidiary, GT&E Information Systems Inc., to provide a variety of data processing products and services.

GT&E Information Systems will market computer terminals, data transmission equipment, and related hardware products, Leslie H. Warner, GT&E president, noted, and it also will provide systems analysis, customer education, maintenance, and software both in support of the hardware products and as separate services. Software represents the computer programs or sequential instructions to the computer that enable it to perform its operations.

"In addition, the new subsidiary will operate as an information service company," Warner said, "providing time-sharing services and facilities management, and distributing through terminals specialized computer-stored information such as stock and commodity quotations."

GT&E Information Systems will include five operating units: Ultronic Systems Corp., Programming Meth-

(Please turn to page 8)

Would you buy it without going inside?

If anybody offers you a price that looks better than ours, you'd better make sure you know exactly what you're getting.

We've just built a low-priced FDM data transmission system that's the best value on the market: the GTE Lenkurt model 25C. Go inside and take a look around . . . you'll find intermixable speeds from 110 to 600 baud. You'll find a built-in 20 mA local telegraph interface for on-premises printer applications. You'll find local/remote test features and a built-in carrier alarm lamp. You'll find it meets TTL, S-level and EIA/CCITT interface standards. And you'll find all the quality and precision we've been known for during 25 years of building data transmission systems.

The 25C comes as an attractive single-channel subset. Or the same duplex channel unit can be shelf mounted — up to 8 channels per shelf with a maximum of 18 channels (110 baud) on each VF line. So it lets you use just one voice channel rather than a lot of data lines. And it lets you do it at a very reasonable price. Add to that the 25C's economy of maintenance and you end up with a bundle of savings.

Write GTE Lenkurt Incorporated, Dept. C720, 1105 County Rd., San Carlos, CA 94070. We'll send you all the inside information.

Circle 2 on reader service card

GTE LENKURT

NEWS BRIEFS

(Continued from page 6)

ods, Inc., Chester Electronic Laboratories Inc., and Commercial Electronics and Data Services divisions of Sylvania Electric Products Inc.

UP plans $1.7 million for C&S projects

A new microwave system will be installed by Union Pacific between Centralia and Aberdeen, Wash., 57 miles. Also, older vacuum tube microwave equipment will be replaced in the present system running from N. Platte, Neb. to Green River, Wyo. Total communications and signal equipment expenditures for 1971 planned by the UP come to $1,695,000. Also included in this expenditure is $398,000 for additional hotbox detectors and $324,000 to replace signal pole lines.

Reading to extend electrification

In the Philadelphia area Reading will spend approximately $1.7 to extend electrification between Hatboro and Johnsville, Pa. This is in part of their commuter territory where they are providing a service to SEPTA.

Railways to spend $291 million for ESC

Sixty-two railways in 41 countries of the world, excluding the U.S., are planning capital expenditures of $291,484,080 for electrification, signaling and communications projects in 1971. The figures were recently published by *International Railway Journal*, a Simmons-Boardman publication.

Algerian Railways are planning to spend $2,156,625 on signal projects and $789,750 on communications projects during 1971.

Five railroads in Australia are budgeting $2,592,800 for electrification, signaling and communications projects during this year. Signal projects on the Commonwealth Railways are budgeted at $11,200, while $86,240 is earmarked for communications. Another $34,720 is budgeted for flashing-light signals at highway grade crossings. Queensland Railways is planning to spend $322,560 on signal projects and $650,720 on communications projects. The signal capital budget for the South Australian Government Railways for 1971 is $280,000. The communications capital budget totals $336,000. Tasmanian Government Railways are planning to spend $11,200 for signal projects and $8,960 for communications projects. Victorian Railways have budgeted $504,000 for electrification, $168,000 for signaling and $179,200 for communications.

The Austrian Federal Railways have allocated $12,500,100 as follows: electrification—$7,353,000; signaling—$4,798,800 and communications—$348,300.

Two railways in Brazil are planning to spend $63,796 on signal, communications and electrification projects. Companhia Mogiana de Estraads de Ferro has budgeted $251,896 for signaling, lighting and communications. Paulista Railway is planning to spend $351,900 for electrification.

In Great Britain, the London Transport Executive is planning to spend $3,120,000 on communications and signaling projects.

Pacific Great Eastern Railway in Canada is budgeting $69,750 for signal and communications projects.

Ceylon Government Railway has a 1971 capital signal budget of $68,000. The communications capital budget is set at $17,000.

The Chilean State Railways is planning an electrification expenditure of $2,510,000, while signal and communications spending for capital projects will total $1,265,000.

In Ethiopia, the Djibouti-Addis Ababa Railway will spend $2,400 for communications capital projects in 1971.

The Finnish State Railways have planned to spend $4,676,644 as follows: electrification—$2,873,520; signaling—$1,046,430; and communications—$756,694.

In France, the French National Railways and the Paris Transport Authority are planning to spend $99,304,800 in the system controls area. SNCF (railway) will spend $12,233,200 for electrification, $16,191,000 for signaling and $9,534,700 for communications. Also, $25,186,000 will be spent for automatic barriers and other equipment for level crossings (railroad-highway grade crossings). Paris Transport Authority will spend $18,079,950 on electrification and signaling projects, and the same amount on automation projects.

Five rail transport authorities in the German Federal Republic will spend $870,586 on capital projects in the system controls area during 1971. Altona-Kaltenkirchen-Neumunster Railway is budgeting $13,555 for signal projects and $12,555 for communications projects. Celle Railways will spend $27,110 on signal projects. Cologne-Bonn Railway will spend $460,870 on signal projects and $27,110 on communications facilities. Hamburger Hochbahn has budgeted $271,100 for communications projects. Signal projects are budgeted at $54,220 and communications at $4,066 on the Sudwestdeutsche Eisenbahn for 1971.

Ghana Railways will spend $61,181 for electrification projects, $218,540 for signaling and $264,600 for communications projects during 1971.

Hedjaz Railway traversing Syria, Jordan and Saudi Arabia is planning to spend $260,000 for signaling and $52,000 for communications during this year.

Kowloon-Canton Railway in Hong-Kong is planning to spend $10,169 on electrification, $101,440 on signaling and $3,120 on communications.

In Hungary the Gvor-Sopron-Ebenfurt will spend $517,200 on signaling and communications projects during 1971.

Italian State Railways is budgeting $35,200,000 as follows: electrification—$12,800,000; signaling—$16,000,000; and communications—$6,400,000.

Jamaica Railway Corp. is planning to spend $24,000 on signal projects during this year.

Six transport authorities and companies in Japan are budgeting a total of $10,956,045 for capital expenditures in the system controls area for 1971. Hanshin Electric Railway Co. is planning to spend $415,200 on signal projects and $57,200 on communications projects. Keio Teito Electric Railway has allocated $207,200 for electrification projects, $84,000 for signal projects, and $84,000 for communications projects during 1971. Nagoya Underground Railway is planning to spend $2,753,720 for signaling and communications. Nankai Electric Railway has budgeted $806,400 for electrification, $313,600 for signaling and $294,000 for communications. Nishi Nippon Railroad Co. is planning to spend $95,000 for electrification, $445,200 for signaling and $148,400 for communications. Also, another $170,800 will be spent for highway crossing improvements. Osaka Municipal Transportation Bureau is planning to spend $2,125 for centralized train control. Tobu Railway Co., Ltd. has budgeted $1,965,600 for electrification, $2,581,600 for signaling and $532,000 for communications.

Korean National Railroad has budgeted $21,450,000 as follows electrification—$16,793,750; signaling—$3,475,000; and communications—$1,181,250.

In Liberia, the Bon Mining Co. Railway (Delimco) will spend $121,995 for central traffic control and other signal projects during 1971.

Luxembourg National Railways is

(Please turn to page 33)

The first data modem was built by gosh-knows-who. This one's built by who-knows-how.

For 75 years, knowing how has been a company tradition as well as an engineering principle at Stromberg-Carlson. And a lot of our know-how is built into our S-C 835 75-, 110-, and 150-baud data modems.

Know-how creates: *simplified speed change.* The flexibility of our design of the 75-baud unit allows the basic modem to be adapted to 110 baud by a simple change of the filters. Changing from 75 or 110 to 150 baud necessitates only the change of the filters and the receiver assembly.

Assured long-term maintenance-free performance. The S-C 835 design, up to telephone-industry standards, results in gear that's at home in any environment. A modem that will perform with consistent excellence for you year after year.

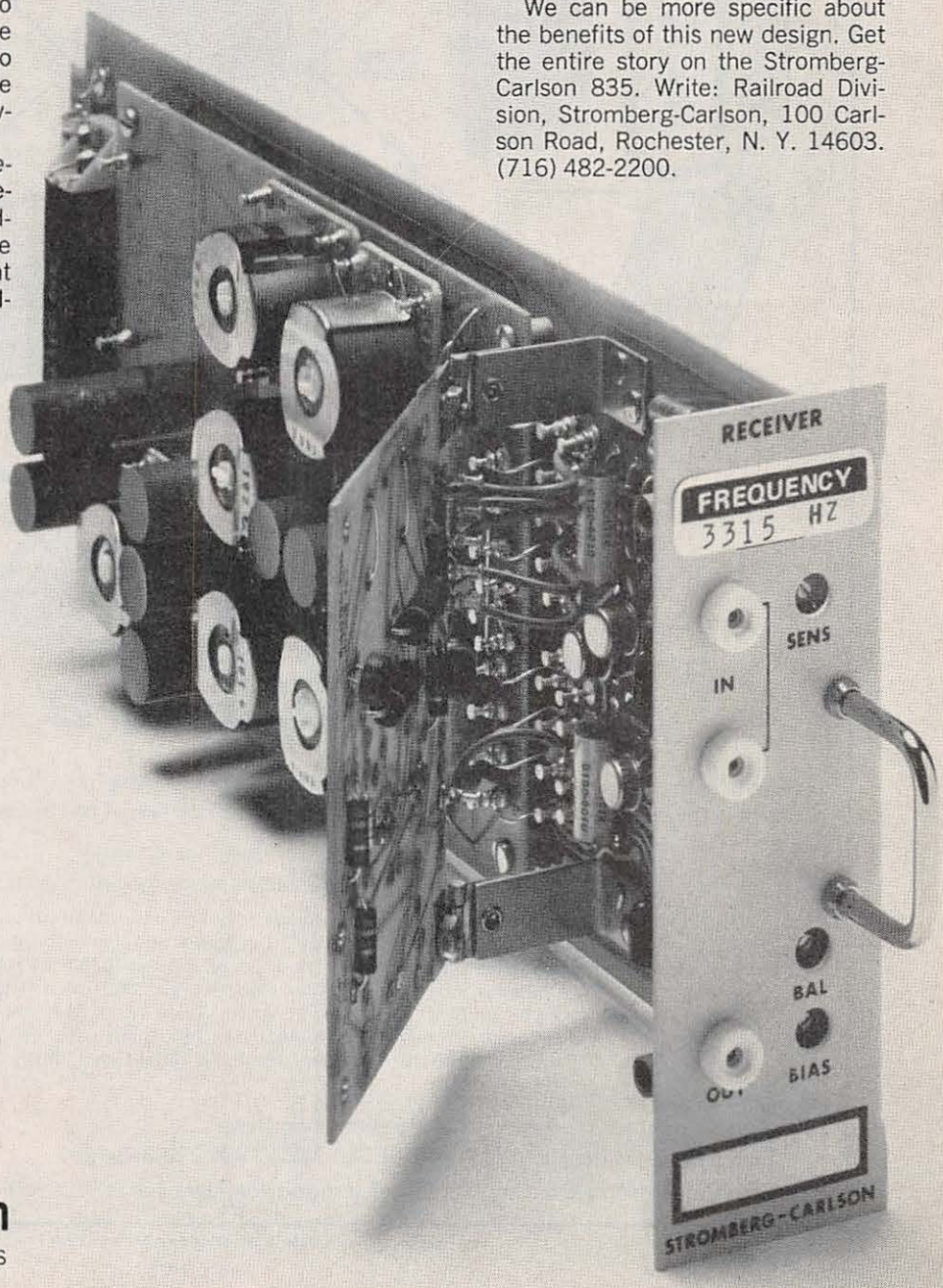
Space-saving functional integration. The interface card, mounted on the transmitter and receiver assemblies, eliminates separate space-consuming interface cards.

Lower power consumption and heat dissipation. A combination of solid-state and integrated circuits that lowers power consumption and heat-dissipation requirements, pushing reliability up and bringing equipment size down.

Ease of testing and line-up. Controls and test points are located on the front of the units, to facilitate alignment and testing of the equipment while it's working.

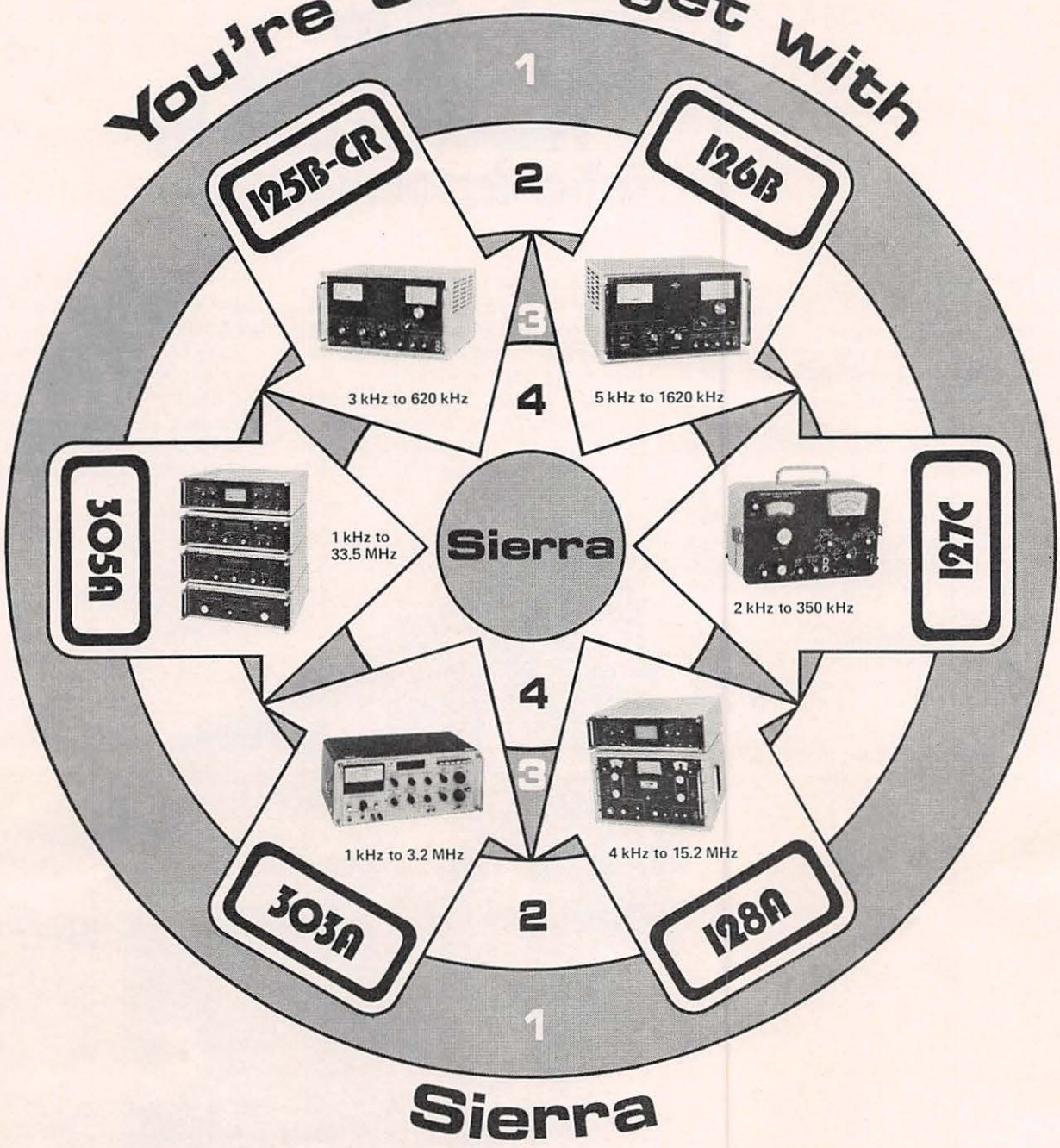
And you'll like the price.

We can be more specific about the benefits of this new design. Get the entire story on the Stromberg-Carlson 835. Write: Railroad Division, Stromberg-Carlson, 100 Carlson Road, Rochester, N. Y. 14603. (716) 482-2200.



Stromberg-Carlson
A Subsidiary of General Dynamics

You're on target with



Sierra

Selecting the right frequency selective levelmeter requires more than just throwing darts. You need quality. And Sierra is the proven quality leader. We also offer a complete line of levelmeters. There's one on target for your needs.

Contact your nearest Sierra Regional Manager . . . he'll be glad to help.
P. S. Also, he'll give you a free dartboard including darts.

Dave Dunn, P. O. Box 265, Littleton, Massachusetts 01460 (617) 369-1059
Donald C. Buscher, 11 Caledonia Drive, Warminster, Pennyslvania 18974 (215) 675-4700
Pat Luczak, 142 Longwood Drive, LaPorte, Indiana 46350 (219) 362-5925
Billy Williams, P. O. Box 157, Clarkston, Georgia 30021 (404) 443-4778
Bob Wylie, 9009 Sirocka Drive, Ft. Worth, Texas 76116 (817) 244-6091
Keath Cowell, (Comm-Well), Route 5, Box 761, Golden, Colorado 80401 (303) 277-0807
Dallas Gill, 3885 Bohannon Drive, Menlo Park, California 94025 (415) 322-7222

For additional information write or call:
Sierra Electronic Operation • 3885 Bohannon Drive
Menlo Park, California 94025 • (415) 322-7222/TWX 910-373-1282

PHILCO Ford

Sierra manufactures a complete line of transmission, data and RF instruments for the communications industry.

Circle 9 on reader service card

50% OFF THE REGULAR ONE YEAR RATE

A FULL YEAR OF
RAILWAY SYSTEM CONTROLS
PUBLISHED MONTHLY
FOR ONLY $1.50
THE REGULAR RATE IS $3.00
YOU SAVE HALF!

OR . . . YOU MAY PREFER:

Two years, only $3.00 **Three years, only $4.50**

This SPECIAL INTRODUCTORY OFFER is limited to new individual subscribers who are employed by a railroad or a rail rapid-transit system in the U.S., possessions, Canada and Mexico.

Now you and your associates may personally subscribe to RAILWAY SYSTEM CONTROLS either at home or office.

You know how important it is that the "new crop" of men in your department be familiar with RAILWAY SYSTEM CONTROLS. That is because this magazine is the best source of information about their work. It sharpens their skills by informing them how men on other roads tackle and lick the same problems which beset them.

Money-back guarantee: if not satisfied, a no questions asked prompt refund will be sent for all unmailed copies.

If you are a reader-and not a subscriber-fill out the card and mail it today!

50% OFF THE REGULAR ONE YEAR RATE

☐ YES, I want **RAILWAY SYSTEM CONTROLS**

(published each month)

Enter my new personal subscription for a full year (12 Issues) at only $1.50. The regular subscription price is $3.00—I save half!

☐ Two years $3.00 ☐ Payment herewith
☐ Three years $4.50 ☐ Bill me

Name_____

Address ☐ Business
☐ Home

City, State, Zip_____

Railroad_____

Department_____

Job or title_____

This SPECIAL INTRODUCTORY OFFER is limited to new individual subscribers who are employed by a railroad or a rail rapid-transit system in the U.S., possessions, Canada and Mexico.

Postage Will be Paid by Addressee

BUSINESS REPLY MAIL

First Class Permit No. 153, New York, N.Y. 10013

RAILWAY SYSTEM CONTROLS

P.O. Box 530

Bristol, Conn. 06010

No Postage Stamp Necessary If Mailed in the United States

50% OFF THE REGULAR ONE YEAR RATE

A FULL YEAR OF RAILWAY SYSTEM CONTROLS PUBLISHED MONTHLY FOR ONLY $1.50

THE REGULAR RATE IS $3.00

YOU SAVE HALF!

OR . . . YOU MAY PREFER:

Two years, only $3.00 **Three years, only $4.50**

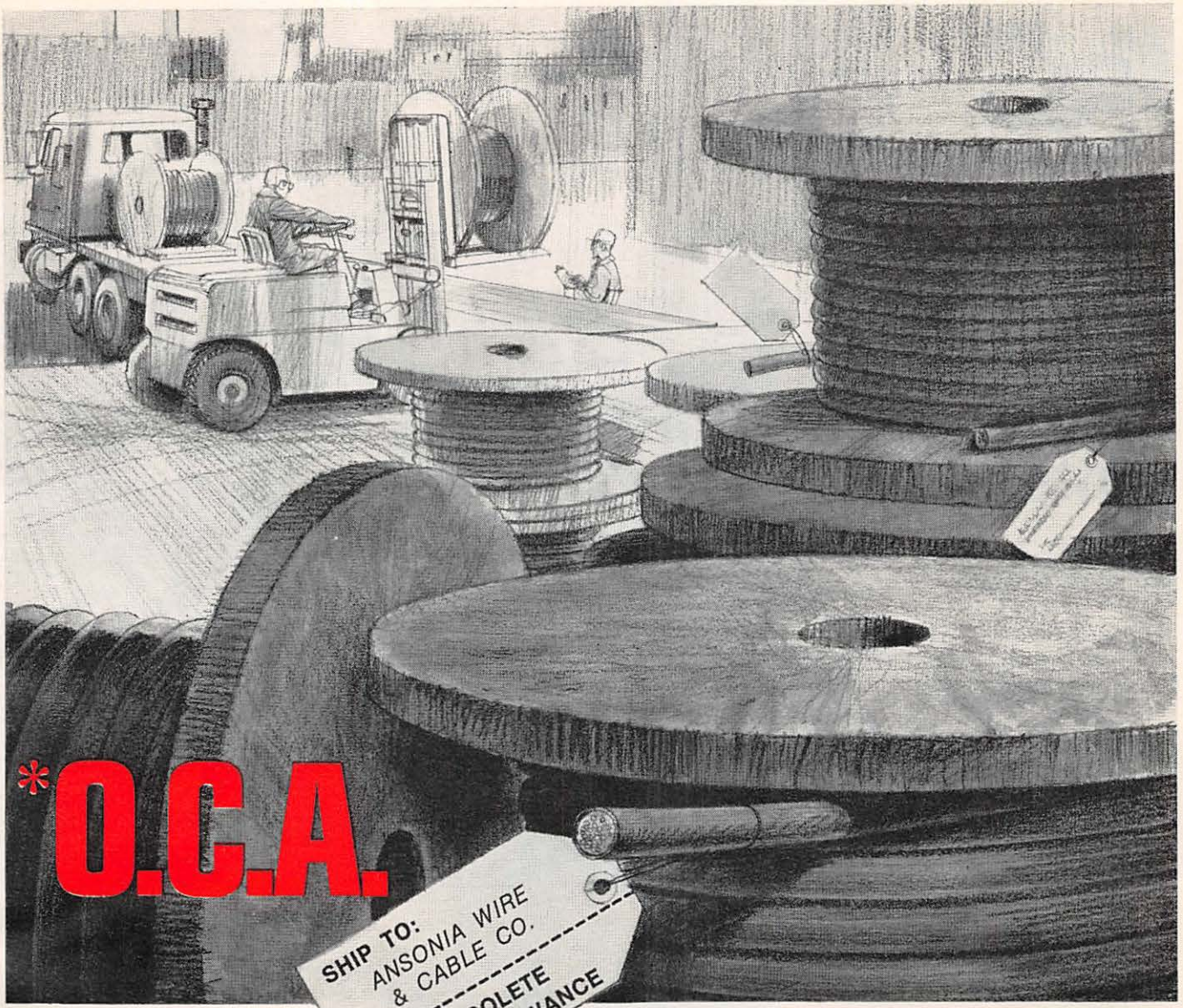
This SPECIAL INTRODUCTORY OFFER is limited to new individual subscribers who are employed by a railroad or a rail rapid-transit system in the U.S., possessions, Canada and Mexico.

Now you and your associates may personally subscribe to RAILWAY SYSTEM CONTROLS either at home or office.

You know how important it is that the "new crop" of men in your department be familiar with RAILWAY SYSTEM CONTROLS. That is because this magazine is the best source of information about their work. It sharpens their skills by informing them how men on other roads tackle and lick the same problems which beset them.

Money-back guarantee: if not satisfied, a no questions asked prompt refund will be sent for all unmailed copies.

If you are a reader-and not a subscriber-fill out the card and mail it today!



Helps you get good salvage value from residuals, shorts, and other replaced, obsolete cable.

***O.C.A.** = *Obsolete Cable Allowance. ANSONIA now enables you to "trade in" unwanted cable for new ANSONIA communications cable.*

"Our O.C.A. policy provides a means for you to get rid of obsolete cable and obtain a favorable credit value against the purchase of our reliable communications, signal, and control cable.

"This credit can amount to even more than 20% of the new cable purchase price, depending upon the cable purchased versus the cable returned. You only pay the freight cost on shipping your obsolete cable to our Ashton, R.I. facilities."

. . . Thomas M. Prentiss, *President*

For complete details on the O.C.A. Policy, request Form No. OCA-20. For sales/service, telephone Neal C. White, Marketing Manager, at (401) 724-6400.

- Single and multi-conductor (2-37) Signal Cable
- Control Cable, 1-33 conductor
- Paired Aerial & Duct or Paired Burial Communication Cable (19 Awg up to 400 pair, 22 and 24 Awg up to 600 pair)
- Quadded Aerial or Quadded Buried (16 Awg from 7-27 quads, and 19 Awg from 7-32 quads)
- Figure 8 Distribution Cable, 19, 22, and 24 Awg

For standard cables listed above or for specially designed cables, call Ansonia for reliable quality and delivery.

THE ANSONIA WIRE & CABLE CO.
Ashton, Rhode Island 02864

ansonia

Circle 4 on reader service card

RAILWAY SYSTEM CONTROLS

Railroads protect edp centers from disaster

"When the earthquake hit us last February, a disc file walked across the room pulling its control and power cables out at the plug-coupler. There was no damage, so we just moved the file back to its original place and coupled it up. It worked fine," reports one railroad's data processing supervisor at Los Angeles, Calif.

For other computer users in the area, most found that loss of power was the major result of the earthquake which pointed up the importance of providing uninterruptible power supplies separate from commercial sources.

Earthquakes are one of the more rare occurrences that can interrupt data processing. Others include power failures, certainly more common, vandalism and fires. In a survey, Railway System Controls asked: *By what means do you protect your data processing centers against physical damage to equipment and data?* Some railroads were reluctant to reply beyond stating that they do take security precautions because of the possibility of damage to operations that could take place if disgruntled employees, war-protesters or student demonstrators decided to take action against the Establishment.

However several railroads are not reluctant to talk because "you can't hide the fact that we use computers and our precautions are no more secret than that taken by any other company. I don't think we're tipping our hand to would-be demonstrators or vandals by telling how we protect our data processing facilities," comments an EDP manager.

Louisville & Nashville reports that its computer center is in a remote location on the 7th floor of the general office building so that no through traffic can occur, hence there is limited access to the facility. Smoking is not allowed and ionization fire detection equipment is installed in the computer center with carbon dioxide hand fire extinguishers strategically placed about the center.

Seaboard Coast Line and Union Pacific have security forces on duty 24 hours daily, the year around. H. S. Thomasson, manager data processing, Norfolk & Western reports that "computer room doors are locked at all times. Only authorized personnel are issued keys. Shift managers on duty are charged with the responsibility of maintaining security."

General practice is that only authorized personnel are allowed to enter data processing centers. Southern follows this policy and goes further to require key cards for entry into the building from 6 p.m. to 6 a.m. on week days and all day Saturdays, Sundays, and holidays. Watchmen are on duty from 4 p.m. to 8 a.m. seven days a week. The magnetic tape vault is protected by an automatic carbon dioxide fire extinguishing system actuated by smoke/heat sensing device. Pyro-alarm smoke/heat sensor alarm systems are located in both computer complexes at Southern's Atlanta, Ga. headquarters. A Halon 1301 fire extinguishing system for the main data processing center has been approved and will be installed in the near future, reports John L. Jones, vice-president management information services department.

Southern Pacific adds the precaution of providing all employees of their data processing center with I.D. cards containing employee picture, social security number and signature.

By what means do you protect the security of the data you process against unauthorized use or theft? Controlled access to the magnetic tape files and library in the computer center by authorized personnel only is the answer given by all respondents in the survey. Also, the tape library is often a fireproof vault. SCL goes a step further and makes all materials contained within the data processing system subject to

MINI-COMPUTER USAGE STUDIED BY MANY RAILROADS

Minicomputers—units that may cost as little as $25,000, or even less —are being considered by several railroads for specialized tasks. While having limited data processing capacity, minicomputers because of their low price can be used for many applications that may not be practical or economical for larger computers. For example, Burlington Northern, Illinois Central and Penn Central are looking at minicomputers to provide intelligence and processing capability for input-output terminals. A mini-computer in conjunction with communications equipment could provide a high-speed programmable terminal.

"C&O/B&O is currently using a Varian 620i as the control device for the off-line exchange of data between IBM magnetic tapes and Univac III magnetic tapes. The IBM tapes are NRZ 512/800 bits/inch density, while the Univac III tapes are phase modulated, 1040 bpi density," reports Dr. H. N. Laden, assistant vice-president research.

C&O/B&O is also planning to use a minicomputer in an instrumented rail inspection car. The computer will control data collection, analyze the data and record the data on magnetic tape. The system will also produce a one-line printed summary of the analysis every mile and print out exception deviations that indicate possible emergency situations.

In addition, "C&O/B&O is evaluating minicomputers both for an independent data collection system and as a communications front end for our larger computer centers," Laden says.

CP Rail has a minicomputer at Sudbury, Ont., that helps with yard office operations and local accounting. This is a pilot project. Future plans for use of minicomputers will be studied on the basis of its performance.

Canadian National has just completed a test project involving two ACI scanners (at ends of Parsley interchange yard in Montreal) connected to a Hewlett-Packard 2114A computer. The system, tested at a CN-CP interchange yard, monitors individual switching moves and provides a net movement report which eliminates duplicate material produced by cars making repeated moves past the scanners. Also produced is an interchange list and yard inventory report of cars (see December 1970 RSC pages 14-18).

When Canadian National Telecommunications (a public communications company) receives commercial telegrams via telephone an operator types the message on a keyboard and it is simultaneously displayed on a cathode ray tube, so it may be repeated to the caller. A minicomputer controls the keyboard-CRT terminal and inputs the telegram into the CNT message switching system for delivery.

While railroad usage of minicomputers might still be considered "mini" consideration is being given to using them for handling data processing locally before transmission is made to large central computers.

a surprise audit at any time. L&N provides a minimum of two operators on duty at all times and all magnetic tapes and discs are stored inside the computer center. Also, data file security is achieved through programming and hardware control.

Southern maintains around-the-clock supervision for all sections within the data processing centers. The magnetic tape vault is protected by a full-time librarian. Stringent control over data is maintained by a data flow system. This is accomplished, says Jones, by: (1) Controlling only data which is of critical status and/or unrecoverable. (2) Mechanically assigning and recording a unique control number to data before they are produced. (3) Filing data by the control number. (4) Selecting data for input by control numbers. (5) Centralizing the selection of input data and placing the primary responsibility in one area. (6) Instituting control checks at four different points. (7) Placing the responsibility of releasing critical status data in one area and controlling that area with around-the-clock supervision.

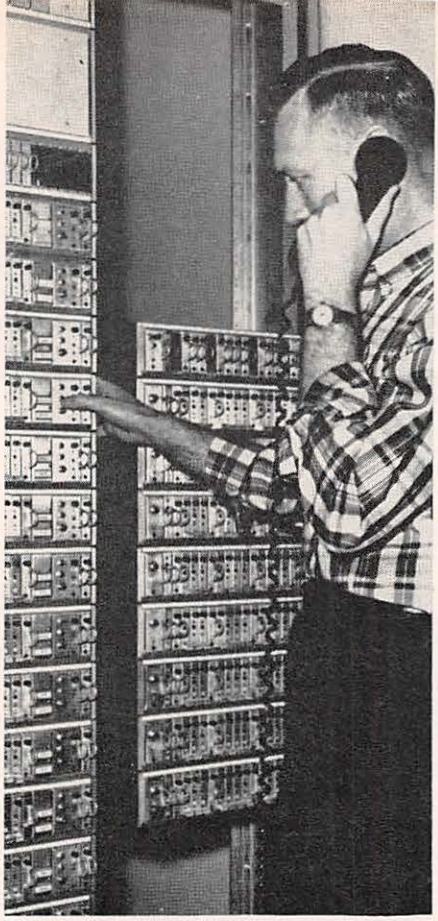
Do you have a secondary data base in the event of damage to your data and/or processing facilities? Generally speaking, the answer is yes, but some railroads do not want to say anything for security reasons. However, five roads responded to the survey with specifics concerning secondary data bases. Louisville & Nashville reports that program tapes and critical master tapes are stored in a fireproof data safe at an off-site location. The stored tapes are updated every three to six months as needs dictate. A card-to-tape utility program is used to store every operational program. Disc files are dumped to magnetic tape for storage.

SCL has a secondary data base in all areas and the more important ones have a duplicate in another city, at which absolute security is maintained. These include computer programs and important master files. This back-up source is updated every time it is used.

"We have a magnetic tape library located several hundred miles from our data processing centers. This library contains duplicates or prior generation of our critical and/or unrecoverable files and is updated as required (weekly, or when produced)," says Jones.

SP has back-up data stored in off-site, atomic-proof vaults in two different locations. Data is transferred to these sites weekly, monthly or at lesser intervals depending on the nature of the data. Also, SP microfilms and stores data in other offsite locations.

UP has a secondary data base of magnetic tapes in fireproof safes. One is in the computer center for active files and the other is in a completely protected vault at a location completely removed from the computer center. UP, like other roads, has no back-up data processing facilities. Because of the variety and availability of computer service bureaus, railroads do not see the need for standby computer hardware. In the event their data processing equipment is damaged, they could use their secondary data base files and work on service bureau computers.



ELECTRONIC TRAINING is essential for electricians, communications technicians and signal maintainers. Home study, classroom instruction or on-the-job training can be provided by Bell & Howell Schools (educational facilities at 8 locations in the U.S. and Canada).

B&H Schools offers electronic training

Transistors, integrated circuits and other elements of solid-state circuitry are appearing in greater numbers and frequency in railroad control systems. "To maintain transistorized equipment, men must have a specialized knowledge and this means an ever increasing need for training of personnel," says H. L. Massie, assistant superintendent of communications, system, Santa Fe. Although speaking for his own road, Massie's words have been repeated by most every manager ever involved with maintenance of today's control systems be it communications, signaling or controls on diesel-electric locomotives and rapid-transit cars.

One railroad that is encouraging its technicians to upgrade their skills to handle new, sophisticated controls involving solid-state electronics is the Burlington Northern. Electricians in the mechanical department—on a voluntary basis—are enrolling in the Bell & Howe Schools independent study course in electronics. In a pilot program at the Dale Street shop in St. Paul, seven electricians have signed with B & H Schools for the fundamentals of electronics course. Realizing the value of training to upgrade the skills of its electricians, BN is paying for the courses. Each man is expected to complete the first course in about three months. "If successful, we shall urge more of our men to take this independent study course," says Harold Wales, manager personnel training in BN's mechanical department. Also, tentative plans are to continue the training for the original seven to progress them through courses in semi-conductors and industrial electronics.

As these men are involved in troubleshooting and maintenance of electrical equipment, particularly on diesel-electric locomotives, training at this time is pertinent because BN has plans for expanding its use of more sophisticated controls and testing equipment for its locomotives. For example, BN will expand its use of SEARCH locomotive testing equipment.

In another area of sophisticated controls, namely weigh-in-motion scales, many railroads are finding it necessary to upgrade the skills of their scale repairmen. Weigh-in-motion scales installed today are of the electronic type, often using printed circuit boards and some of the latest make use of integrated circuits. The electro-mechanical controls for scales is a thing of the past. Also, there is considerable interest in tying weigh-in-motion scales to automatic car identification systems. Coupling scales and ACI provides identification of cars and the weight of their contents, vital for billing purposes especially for coal or ore shipments.

Following a recent meeting of the National Scale Men's Association at which a presentation was made by Robert L. Wallace, director of graduate placement and industrial marketing, B&H Schools, several scale technicians have subscribed to an independent study program. The program is made up of three basic modules: fundamentals of electronics, intermediate, and advanced electronics. Each man takes a qualification test to determine at what point in the program an individual should begin training. "The objective of the training program is to upgrade electronic maintenance capability of present scale maintenance people to be able to meet maintenance requirements for the electronic scales now in service and being installed," Wallace says.

B&H Schools has resident educational facilities at eight locations: DeVry Institute of Technology in Chicago, Atlanta, Dallas, Phoenix and Toronto, Ont.; DeVry Technical Institute at Union, N.J.; Ohio Technical College at Columbus; and Central Technical Institute at Kansas City, Mo. These schools specialize in training men in electronics. They provide a complete educational package from professional consulting on training, course selection, qualification testing, administration of educational programs, including progress reports to students and employers, and a national placement service for graduates, Wallace states.

In a given year over 200 companies ranging from manufacturers to transportation companies have successfully used B&H Schools industrial training programs. These independent study programs are of a programmed instruction type. People can study at home, while many are able to study at work on company time. B&H Schools can provide for training at their eight resident schools or at a firm's plant site. For example, Arizona Public Service Co. (a utility) is sending 25 men to the Phoenix school for a program in solid-state relaying. Nuclear-Chicago Co. is providing on-site courses with a B&H Schools instructor to train test technicians in the area of integrated circuits.

As part of the home study operation, help sessions are now being held at the resident schools and other B&H locations. Individuals are notified of times—on Saturdays, and students reply indicating their desire to attend and state in what areas they desire help. The

help is in the form of specialized classes.

Electronic training capability, as mentioned earlier with regard to mechanical department electricians and scale men, will also apply to communications and signal maintenance personnel. B&H Schools have courses available covering communications, electronics, second and first-class radiotelephone operator, the latter two preparing the student for the FCC examination. Culmination of the radio telephone course is the student passing the FCC examinations.

"As more and more long range communications/computer systems are conceived the demand for talented systems analysts will become even greater. Certainly the software houses themselves who desire to sell back to us will be our greatest competition for this type of scarce resource. This scarcity will demand that a greater portion of our activity be devoted to training in-house as opposed to training offered by vendors in the early 60's," stated J. W. Germany, general manager, systems management services, Southern Pacific Transportation Co., at last fall's Data Systems Division, AAR, annual meeting.

Equally vital is the programming requirements of these communications/computer systems. Also, many roads are now interested in interchange of data as well. Now most roads upon receipt of a loaded car manually introduce waybill data into their information systems, whereas with data interchange this would not be necessary. However, many would have some reprogramming to do for their computers to accept and make use of the data. "For example, it's going to mean some major programming for Burlington Northern to take full advantage of the now available interchange of freight revenue abstracts. It will mean substantial savings to us," says Frank H. Coyne, vice-president, finance, BN.

B&H Schools has an Institute of Business & Computer Education which provides an independent study course in computer programming. Background and applications of computers are included in the course. The IBCE course teaches three programming languages: BAL (Basic Assembly Language), COBOL and FORTRAN. Students learn to write program routines which are processed on an IBM 360/30 computer. Results are analyzed by professional computer programming instructors, which are returned to students with comments.

Another function of B&H Schools is that of placement of graduates in industry. For example, railroads will find these graduates qualified for radio and electronic technician positions.

AUTOMATIC CAR IDENTIFICATION systems require careful planning.

How GTE Information Systems aids railroads

May Day—a significant date for United States and Canadian railroads—passed with about 100,000 freight cars in the interchange fleet still not equipped with automatic car identification labels. May 1, 1971 had been the deadline set by the AAR for complete labeling of the interchange fleet.

Reasons or excuses for failure to meet the deadline on the fifth try included: "We don't have the money. The cars we haven't labeled are not in interchange service. Why spend money for labels when we don't have any scanners to read the labels." Also the reverse has been cited: "Why spend money for scanners when the fleet is not labeled."

Estimates are that railroads have spent about $17 million for car labeling so far with another $1 million or so to complete the job. The total label cost may reach $20 million considering cost to maintain, repair or relabel damaged or incorrectly labeled cars.

As for scanner money, William S. Wheeler, vice president and general manager, Transportation and Industrial Division, GTE Information Systems, Inc., has this to say: "For about 1¼% of the annual expenditures for buying or building new freight cars, railroads could install 500 ACI systems. This certainly is a small price to pay for better control and utilization of the existing freight car fleet."

The T&I Division—formerly the Commercial Electronics Division of Sylvania Information Systems and reorganized into GTE Information Systems—is the developer and manufacturer of the KarTrak automatic car identification system that has been accepted by the AAR as the standard to be used by Canadian and United States railroads.

Wheeler's statement is but one of many results of economic and operational analyses undertaken by the T&I Division to progress ACI for its customers. A few of the more important studies include:

—Terminal analysis procedure.

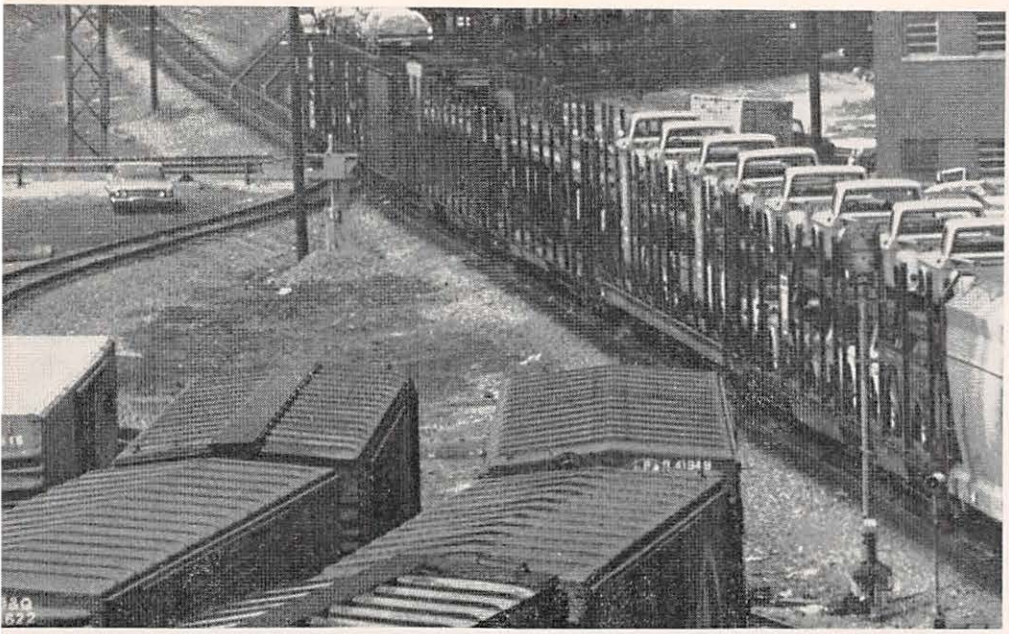
—Analysis of ACI system checking pullout in a hump yard.

—Analysis of ACI system checking inbound and outbound consists.

—KarTrak ACI site survey worksheet.

—Communications criteria for KarTrak ACI 800 series equipment.

Additionally, customer training pro-



CHICAGO TERMINAL DISTRICT may have operational ACI by end of 1971.

grams were developed: (1) a 4-day ACI management seminar; and (2) a 5-day KarTrak ACI system 800 series technical training course.

The terminal analysis procedure,—a major work of Richard J. Schiefelbein, systems engineer,—is a method designed to assist a railroad in determining the optimum network of ACI scanner locations. It is an evaluation method using cost and volume as variables that will provide maximum scanner coverage with minimum equipment expenditure.

This terminal analysis procedure is the result of a joint feasibility study conducted in the Chicago Terminal by the General Managers' Association of Chicago. It is a reliable method of determining the feasibility of joint ACI facilities in a terminal. Once feasibility is determined, a second phase of analysis is recommended. This will require the use of computer facilities to check for further economies. Out of this GMA project, the KarTrak ACI site survey worksheet was developed. It provides details for cost of equipment, as well as information for individual scanner installations.

The report on the application of ACI for checking the pullout of a hump yard concerns the impact on operations and the cost savings which could be achieved. The analysis was done on a typical yard and the hard cost savings resulting from the installation of two scanners located at the junction of the classification yard and the departure yards could result in a return on investment from 48% to 145% depending on the specifics of yard operation. This report details the cost savings anticipated and presents the necessary factors such that a similar analysis can be done for any specific yard application.

Beyond the hard cost savings, there are many direct benefits resulting from such a system. No cash benefit has been assigned to such items as faster service, reduction in lost cars, or increased effective capacity of facilities. The hard cost savings in themselves provide more than adequate justification for the installation of such a system.

Similarly, the report on the checking of inbound and outbound consists determines for a typical yard a 29% return on the investment. This report, too, shows methodology for applying the analysis to any yard.

Copies of these reports are available to railroads to help them make ACI feasibility studies on their own properties and tailored to their operations.

In addition to an operations and maintenance manual for KarTrak equipment—the latest being the 800 series—the T&I Division has prepared a Communications Criteria guide for the 800 Series equipment. Here again, is information developed in considerable detail to help the railroads implement their ACI projects.

The ACI management seminar consists of the following: *First day*—Active hardware demonstration of the KarTrak system in a simulated railroad environment; history of ACI development; current market status including market forecast; movie of an operational system; and the quality of labeling. *Second day*—ACI applications; terminal analysis procedure; installation requirements; and a review of the GTE field acceptance procedure including demonstrations of label reading parameters. *Third day*—Communications interfaces; programming message matrix and IBM 1050 control functions; and ACI check list for specific system configurations. *Fourth day*—Overall system description at block diagram level; and operation of a test set to include static/dynamic operation of scanner and decoder.

The technical training course consists of the following subject matter: *First day*—Active hardware demonstration of KarTrak system in a simulated railroad environment; installation requirements; label characteristics; and system block diagram analysis. *Second day*—Physical description and functional block diagrams of both scanner and decoder; field acceptance procedures; and demonstrations of label reading parameters. *Third day*—Test set operation for basic decoder configuration; functional description of options; programming the message generator. *Fourth day*—Communication criteria including the IBM 1050 interface; and how to program for this interface. *Fifth day*—Normal and abnormal operation; review of previous subjects, and preparation of customer check list.

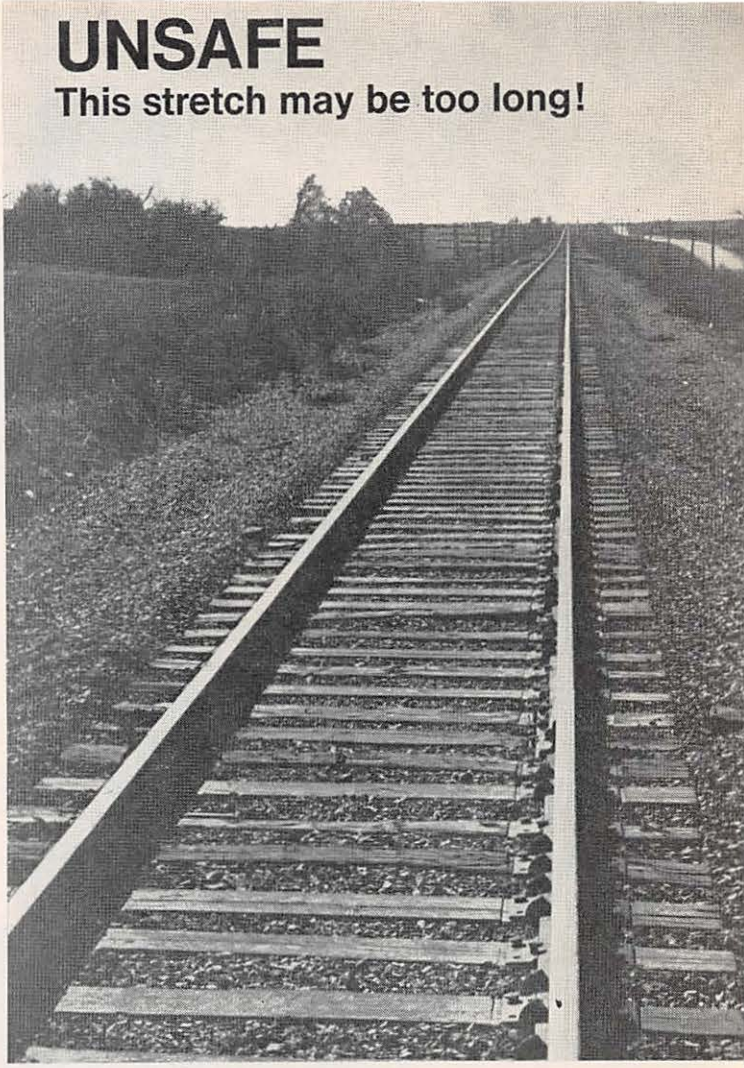
Several railroads having ACI systems, but find the car fleet not completely labeled are able to benefit from ACI generated consists. GTE Information Systems people call it data enhancement. Simply, it means comparing on a line-by-line basis an ACI printout with an advance consist, outbound consist, interchange report or industry switch list. With ACI accuracy in the 99% range, unlabeled cars are quite easily spotted, as are errors in an advance consist, for example.

Above are mentioned just a few of the things that GTE Information Systems has been and are continuing to do to help the railroads make ACI an effective tool for better car and motive power control and utilization..

At the engineering level, Wilson P. Boothroyd, senior staff engineer, GTE Information Systems has been working very closely with the Data Systems Division, AAR, Ad Hoc Committee on ACI Installations. Also, Boothroyd is a member of the Communication & Signal Section AAR, Committee to Study and Develop ACI Hardware Standards.

"ACI can be a very effective control system for better utilization of cars and motive power. And of great importance is its ability to provide accurate input to a railroad's data base for management and operational information systems," says W. Earl Trantham, Jr., Manager, Transportation Control Systems, T&I Division, GTE Information Systems, Inc.

The Chicago GMA project affords an opportunity for railroads to demonstrate that they can cooperate in using technology to solve two major problems —reducing terminal delays and improving car utilization.



Our new rail-mounted SERVOSAFE® Hot Box Detective™ prevents axle burn-offs and derailments.

It's a good thing to have on your railroad.

But, for safety's sake, don't stretch a good thing!

Do you have long stretches of track without SERVOSAFE protection?

Recent studies have revealed that such factors as heavier car loadings, faster train speeds and greater accelerations have combined to increase the incidence of overheated journal boxes. This has prompted many railroads to review their spacing of hot box detectors. Up to now, the average spacing has been 25 to 30 miles apart along line-of-road. Under today's conditions, however, a hot box can develop in less than 25 miles and cause a derailment *between* detectors.

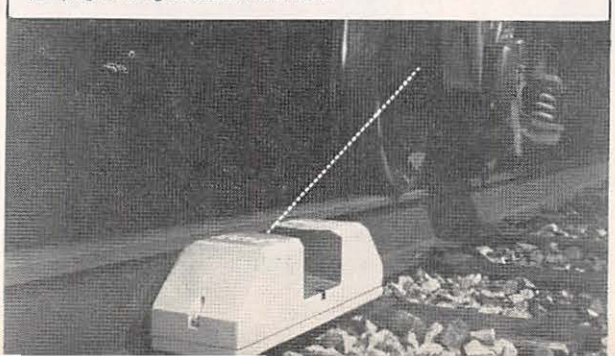
One solution becomes self-evident: closer spacing of hot box detectors for more protection. A SERVOSAFE system will not prevent a hot box—but it will detect, locate and warn of a hot box before the condition worsens into a dangerous, costly axle burn-off and derailment!

Will it cost you more to get this additional SERVOSAFE protection? Not really. Here are some reasons why not:

Our new Model 8808 SERVOSAFE system features patented rail-mounted scanners and solid state electronic data processing for the fastest, most precise detection of hot boxes. It allows remedial action to be taken *before* a failure occurs, and helps cut down the high costs of major salvage or replacement. The cost of installation and maintenance is appreciably reduced by eliminating the need for concrete foundations, special ties and expensive roadbed preparation. The rail-mounted scanner can be easily removed for maintenance or relocation. Finally, compare the cost of a SERVOSAFE with the $200,000 involved in just one derailment that could be prevented.

That's why most prudent, progressive railroad managements agree when we say, "More SERVOSAFE protection isn't costly—*lack of it is!*"

Model 8808 SERVOSAFE Hot Box Detective Rail-mounted scanner "looks" at journal bearing behind truck frame with a vertical, close-in target scan for greater uniformity and accuracy. Scanner is securely clamped to the rail (no drilling required). Accuracy is not affected by rail pumping, running or lateral movement.



servo

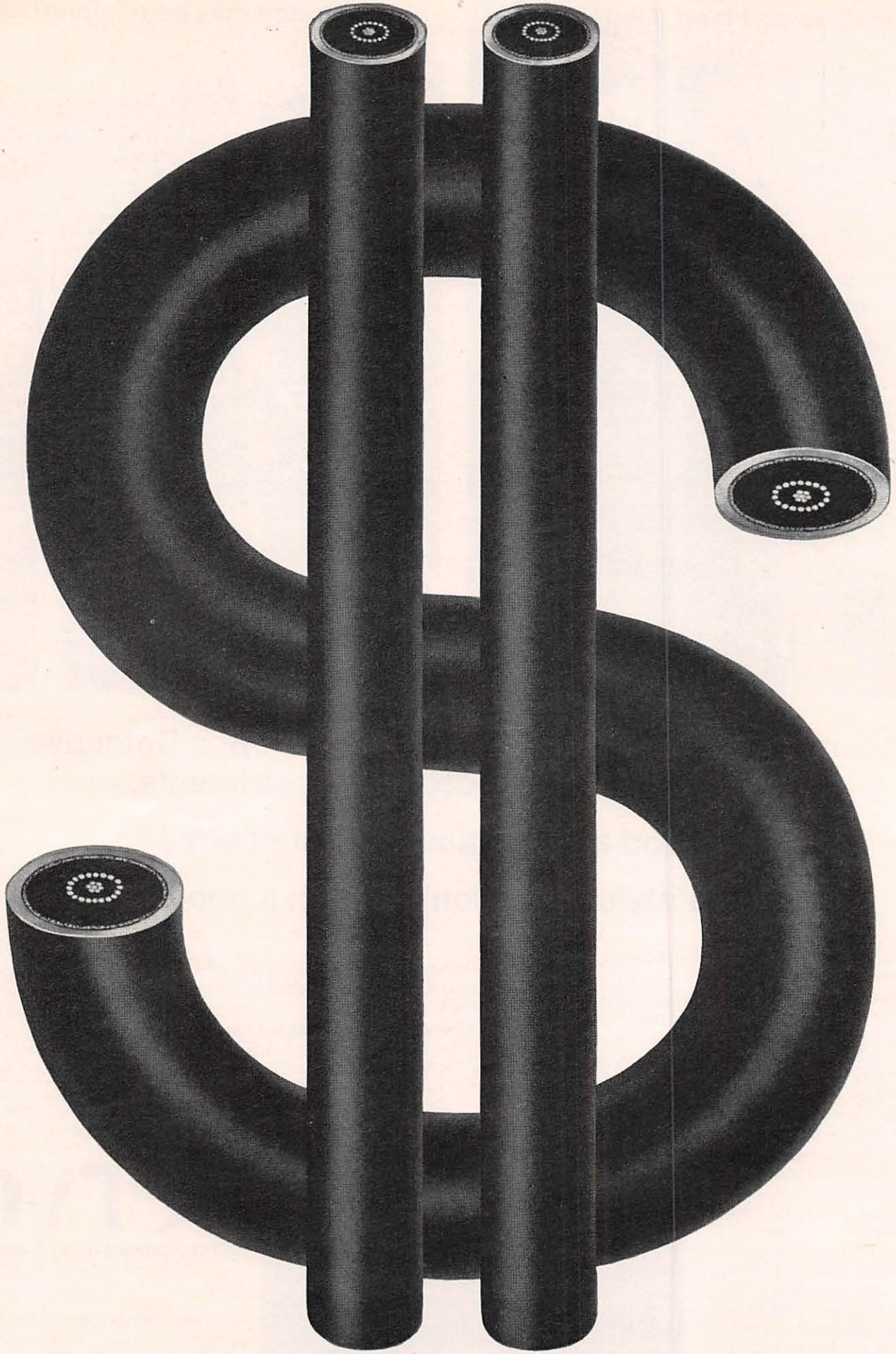
SERVO CORPORATION OF AMERICA
Hicksville, N.Y. 11802 • Tel. 516-938-9700
European Office: Lausanne, Switzerland

Serving Safety Through Science

Since 1957, more than 1,000 SERVOSAFE Hot Box Detective systems have been put into service on 54 of the world's major railroads, and have compiled an unequaled record of safety improvement and cost reduction.

Circle 12 on reader service card

MEMBER RPI



Today, it is more profitable than ever to invest in quality.

Reliability in cable is not a luxury, it's a necessity; replacement cost is prohibitive.

Specify Kerite! You get the Quality Assurance of 116 years of superior performance.

The Kerite Company · Principal Offices: New York; Chicago; Seymour, Connecticut · Sales representation throughout the United States · A subsidiary of Harvey Hubbell Incorporated.

MEMBER RPI Kerite

the cable that lasts . . . and lasts . . . and lasts . . .

MP planning operational control

Missouri Pacific well along with design of information-gathering network to support operational planning and control system.

Missouri Pacific is in the midst of planning, installing and implementing a management operational planning and control system. Detail design of the information gathering phase is now being done with installation to be started in 1973 and completed early in 1975. To improve the data base prior to that time, an interim data system is being installed which basically consists of an improved communications system plus expanded data inputs concerning car movements at major terminals. Design of the major decision making functions is under way with installation of the total car movement control system to be completed in 1977.

Details were outlined in a paper presented at the Third International Symposium on Railway Cybernetics by R. B. Schoultz, senior project leader, and D. W. Salzman, project leader, management information division, MP. An abstract of their paper follows:

The system being developed by MP will utilize in excess of 250 input-output locations, an extensive communication network and a centrally located processing unit to control the operation of 12,000 miles of railroad serving 75,000 customers in 13 midwestern states. The daily movement of 400 trains, 250 switch engines and 70,000 cars will be affected by this system.

The information portion of this planning and control system will provide all levels of transportation management with the information necessary to define, plan, control and evaluate the performance of their operations. A significant innovation of the information system will be the computer generation of car movement schedules for the approximately 18,000 cars per day that are released from industries or received in interchange from 79 connecting road haul carriers.

Car movement scheduling is based on the premise that no car should be moved until a need for its movement has been established, a complete route and schedule of movement has been developed, and the effect of the interaction of the proposed movement with other movements on the railroad has been determined. This schedule becomes a guideline from which the car's actual movement is controlled and against which it is monitored. Failure to comply with the schedule will result in the car being rescheduled for the balance of its movement and an exception being reported if the time of final system disposition is adversely effected. Final system disposition is considered as the placement of the car on the industry, yard or transfer engine, local train or through train which performs the final handling of the car on MP.

Requests for car movements will be initiated by customers, terminals and car distributors. Car distributors will request the movement of empty cars to industries and between geographical areas of car supply and demand. Empty car movements will be developed utilizing information concerning cars released, cars ordered and empty cars received in interchange.

Inputted data concerning requests for car movement will include the location of final system disposition. This data will be used in conjunction with computer files to determine the possible internal system routes. The routines that will develop the possible routes of movement will consider the priority of routes for the particular type of movement, special instructions to be observed during the movement, locations on the possible routes where special instructions could be accomplishd, and restrictions imposed by the possible routes on car type, weight, height, length, width or commodity carried. Using the possible routes that have been developed, the computer will then determine all car destination grouping (i.e., blocking) alternatives that could be utilized.

After the possible route and blocking patterns have been determined, the trains and switch engines that could handle the blocks in each blocking pattern will be selected from a file containing the schedules of all regular trains and switch engines. The scheduling function will then choose the move-

MANAGEMENT INFORMATION

system

Missouri Pacific is developing a computer-oriented information system designed to gather data and develop information essential to the control of car movements. The system will develop a movement schedule for each car made available to MP and will report an exception if the car is subjected to handling which delays its scheduled time of final disposition.

The computer will generate car movement schedules for the approximately 18,000 cars per day that are released from industries or received in interchange from 79 connecting road haul carriers. Information gathering design work is now underway with total operation by 1977.

ment schedule which provides the earliest time of final system disposition of the movement. Factors which will be considered in determining the schedule include: (1) the time the car is available for its initial movement; (2) the schedules of the trains or engines on which the car could move; (3) terminal or yard through-put times for various operations; (4) train schedule combinations available over the possible routes including scheduled intra-terminal movements between yards; and (5) restrictions imposed on particular trains regarding the types of cars handled, mechanical specifications of cars, maximum permissible speed of cars or types of commodities carried.

For each car on which there is insufficient information to establish a complete schedule at the time it is made available for movement, a schedule will be developed for its movement to the furthest known system destination. This movement schedule will be appended when the additional information is provided.

After a movement schedule has been selected, the car will be added to the anticipated consist of each train on the schedule. The anticipated consist is a list of cars assigned to a train. In some cases this train assignment information will be available several days in advance of the actual handling.

Prior to the departure of a train, terminal personnel will interrogate the computer for the car assignment information contained in the train's anticipated consist. This information will be used to analyze the amount of work required to make up the train and the amount of work the train will have to perform on its route of movement. After analyzing this information, decisions will be made concerning any desired additions, deletions or revisions in the work to be performed.

Completion of the train makeup will result in the computer creating an actual consist of the departing train which will be compared with its anticipated consist. If a car is on the actual outbound consist, but is not on the anticipated consist of the train, it will be deleted from all anticipated consists to which it previously has been assigned and a new schedule will be developed based on the car's actual outbound movement. If a car is on the anticipated consist of an outbound train, but is not on the actual consist, it will be taken off all anticipated consists to which it has been assigned and a new movement schedule will be developed based on an assumption that the car has just been made available for movement at its location. If the new schedule developed in either of these cases adversely affects the time of final disposition, an exception report will be generated.

Control information will be provided for each aspect of the transportation operation by the issuance of work orders which will reflect car handling instructions derived from car movement schedules. A work order is a list of cars that a train or engine is to set out, pick up, or move at an industry, interchange, station, or yard. A car may be listed separately on a work order or its listing may be implied such as a car in a block of cars with only the first and last cars on the block listed. A work order will be issued for each car movement to be performed under the control of the computer system.

The movement of cars within a terminal will be directed by work orders reflecting car location, destination (block), and the train or engine scheduled to perform the initial or outbound movement. A terminal will input the accomplishment of the work order, the time of accomplishment and any exceptions. Exceptions will occur when a crew finds conditions at an industry, interchange or yard different from those shown in the work order or if additional work must be performed that is not covered by the work order. This accomplishment information will be used to maintain yard and industry car location inventories and to supply data required for car hire and car detention accounting.

The movement of cars not located in the responsibility areas of terminals will be directed by work orders issued to road-train crews. The accomplishment of these work orders plus any exceptions will be reported at the location of accomplishment or, if communications are not available, at the first location with available communications subsequent to the location of accomplishment. The reporting as exceptions of car movements that were deviations from or were not covered by a work order will initiate the development of a new movement schedule. If the car had been picked up, this schedule will cover only the movement of the car on the train performing the work. A complete movement schedule will be assigned to the car when it arrives at the terminating location of the train. If the car had been set out in error, the new schedule will be completed for the movement of the car from its present location to final system destination. If the new schedule adversely affects the time of final system disposition, an exception report will be generated.

Cars set out bad ordered or to reduce tonnage will be considered the same as other car movements performed without work orders and will require that a work order exception be reported by the crew. These cars will enter a suspense status and will be deleted from the anticipated consists of the trains on which they had been scheduled to move. When the car is released from the suspense status, a new movement schedule will be developed.

The routing and scheduling of car movements plus the reporting of exceptions to these schedules will not result in car movement control. Because of a general inability to completely negate the effects of a mishandling, it is important that the control system be designed not only to recognize and report exceptions to scheduled movements, but also to assist in preventing exceptions from occurring. The major value of car movement scheduling is that it allows the decision maker to determine in advance the probable effect of a decision concerning car movements.

Cars move in trains and it is only by

Central train planning bureau responsible for moves

controlling the makeup and movement of trains that car movement control can be accomplished. Responsibility for all car and train movements will be vested in a central train planning bureau which will delegate authority for industry, transfer and local movements to terminal and line-haul supervisors located in the field. The central bureau, however, will retain authority for the coordination and integration of all movements. Its decisions will be based on data provided by the system plus advice and information from supervisors of terminal and line-haul movements, other operating officials, yardmasters and dispatchers. On-line operating personnel will be guided by operating directives issued on a real-time basis by the central bureau. These directives will be issued to authorize deviations from normal operating procedures such as: (1) running extra trains; (2) annulling or consolidating trains; (3) revising scheduled departure times or normal blocking practices; and (4) changing the connections to be made, the work to be performed, or the traffic to be handled by a train.

The local supervisor of terminal movements will control car movements to and from industries and interchange locations, between yards within the terminal, and to and from a suspense status (hold track, bad order repair track, car cleaning track, etc.) within the terminal. He will also control movements in the terminal involving cars which arrive at and/or depart from the terminal on through trains. His actions on these movements will be guided by directives from the central bureau establishing priorities and authorizing deviations from normal operating procedures.

Authority for local line-haul movements will be delegated by the central bureau to a supervisor of line-haul movements who will control car movements to and from industries and interchange facilities at locations not under the control of a terminal movement supervisor. He will coordinate the movement of local trains with their originating and terminating terminals and will integrate local and through train operations in conjunction with the central train planning bureau. He will also coordinate with the central bureau pickups and setouts to be made by through trains and will request authorization for any special moves he desires to make using through trains.

The placement of total responsibility for all car and train movements with the central train planning bureau will assure that decisions will be made for the benefit of the total system rather than any particular operating entity.

In addition to controlling the movement of trains and cars on a real-time basis, the central train planning bureau will also analyze exception reports and operating costs to isolate problem areas. Studies will be made of these areas by the central bureau and solutions intended to eliminate or alleviate the problems will be implemented. Because the central bureau will also be responsible for long-range transportation planning, it will have access to a transportation planning group which will undertake studies requested by the central bureau.

Will set performance standards for terminal and road moves

Although most line-haul railroads publish freight train schedules for use by their shippers, we realize that these schedules often do not reflect the manner in which the railroads are actually operated. Because car movement scheduling will require that realistic schedules be developed, standards will have to be established for operations performed in terminals and for over-the-road movements. For the first time, managers from the operating and traffic departments will be forced to specify the service which should be afforded each possible car movement.

The increased importance attached to the performance of reliable service will result in some changes in the duties performed by various levels of operating officials. Decisions concerning real-time operations will be made by the central bureau and by supervisors of terminal and line-haul movements. Intermediate managerial levels will be relieved of this function thus leaving them more time to perform administrative and planning functions. One of their major responsibilities will be the development, in conjunction with personnel from the traffic department, of recommendations designed to improve the competitive position of the railroad on traffic originating or terminating in their territories. Duties of operating officers assigned to supervise line-haul or terminal movements will be largely limited to the control of car and train movements.

The system being developed not only changes the indices utilized in evaluating the performance of the railroad, but also changes the manner in which transportation management evaluates the performance of individuals reporting to them. Traditionally, performance has been evaluated on the basis of costs and traffic volumes associated with particular responsibility areas such as terminals, divisions or districts. This method, which fails to consider the interaction between operating elements within the railroad, results in autonomous operating entities being established at each level of operations. Decisions made are understandably designed to improve the "performance" of the particular operating entity with little regard being given to the affect the decision will have on other operating entities or on the total system.

The system being developed by the Missouri Pacific is designed to integrate and coordinate the operations of the total railroad and thus overcome many of the problems presently associated with these local autonomies. Not only will local operating officers be relieved of the detailed decisions affecting real-time operations, but their ability to unilaterally change local operating patterns will also be restricted. Although they will still have primary responsibility for recommending changes in operations, before these recommendations are implemented they will be submitted to the central train planning bureau which will study them to determine any possible adverse effects on other areas of the railroad. Since the major functions of these local operating officers will be administration and planning, in the future it will be their performance of these functions on which they will be judged.

Decisions of the central train planning bureau will result in increased or decreased operating expenses at particular locations, prevent some exceptions from occurring, cause some to occur which otherwise would not, and change the locations at which exceptions occur. Because of this, it is the total performance of the railroad that becomes important and it is on this basis that the system must be judged. Any performance measurement of individual line-haul or terminal movement supervisors will have to take into consideration the effect of decisions made by the central bureau.

MANAGEMENT INFORMATION

Seaboard Coast Line's Railroad Operations Control System is concerned with central decision making over a whole railroad in the areas where the operations can be changed, and do change, very often. The basic intent is to control the operations changes in a more rationalized fashion, so that changes which happen, are made to happen with the foreknowledge of what affects (both good and bad) any change might have on any other part or function of the railroad. With the techniques which will be used in this system SCL can schedule car movements onto and off trains and through yards so as to minimize the time, or cost, needed to move all cars from their originating point to their destination, keeping in mind all train length and weight restrictions, capacities of the yards to do the work necessary in train operations, etc. The system will not make a decision which will alleviate one yard's congestion at the expense of another. Rather by carefully planned use of trains and yards, the railroad system should settle down to a much smoother and, hence more economic, operation.

SCL goes to operations control

SCL's new operations control system will fully exploit its existing system and will be enhanced to provide actual control of freight operations.

Planning and implementation of a computer-based management information or railroad operating control system is complex and takes time. Also, one just can't throw away an existing system, at least most railroads can't afford to do so. Seaboard Coast Line's Railroad Operations Control System will fully exploit their present teleprocessing system which will be enhanced to provide the additional information required for centralized real-time control. Design and programming of Phase I is expected to require two years with an additional year for complete cutover.

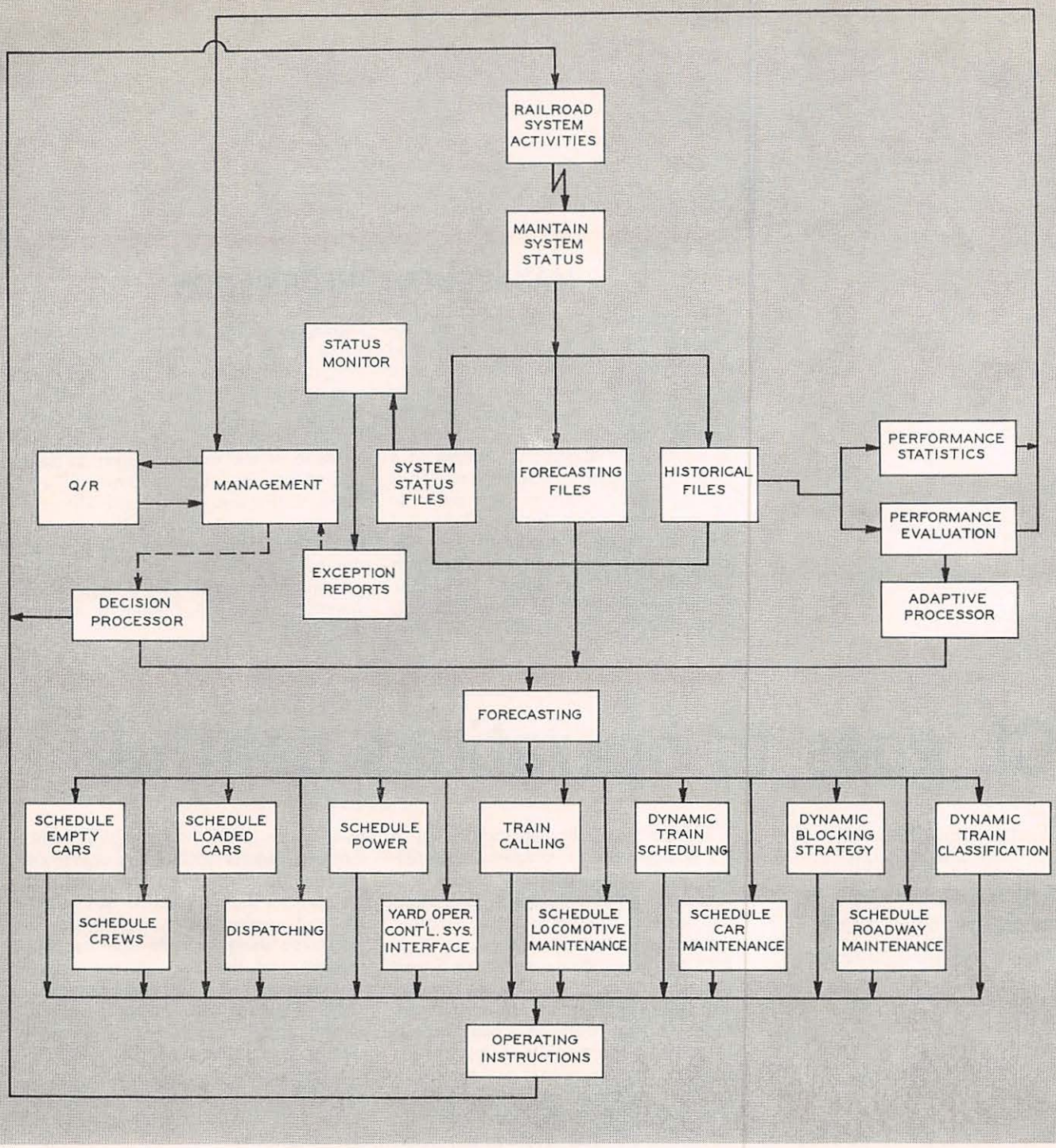
Details of SCL's present and new ROCS were outlined in a paper presented at the Third International Symposium on Railway Cybernetics. Authors are L. H. Scott, assistant vice-president, systems and information services, SCL; E. Wrathall, transportation industry marketing, data processing division, IBM Corp.; and S. Poley, senior engineer, New York scientific center, IBM Corp. Abstract of the paper follows:

SCL's current teleprocessing system consists of 30 leased lines and 70 terminals. Fifty-five of these terminals are IBM-1050s located in yard offices. Two in-house 1050s are located in SCL's Jacksonville computer center. In addition, there are seven IBM-026 keypunch machines located at other terminals to facilitate keypunching. This network handles 300 million characters per month. From this, the computer maintains a file on 175,000 cars in initial and number order, containing the last three move records, the last two receipts and the last delivery (which may be one of the last three move records). This file also contains waybill information for each car, equipment master information, and the alphabetical spelling of the origin road initial, city and state, and permits response to more than 200,000 car location inquiries per month.

Each IBM 1050 terminal includes the following components: 1051 unit, 1056 card reader, 1053 printer and 1058 printing card punch.

Data is transmitted from the remote 1050 terminals to the central computer, an IBM/360, model 40, located in SCL's general offices, Jacksonville, Fla., and to other 1050 terminals via the central computer. QTAM is used to control the transmissions.

The system is designed to capture waybill information at or near origin or oncoming junction and transmit this information to the data processing center over leased communication lines from one of the 1050 terminals. When waybill information cannot be captured at origin or oncoming junction, it is obtained as soon as possible after receipt of a car, or after being billed, by punch-



REAL-TIME, ON-LINE COMPUTER is key to SCL's railroad operations control system.

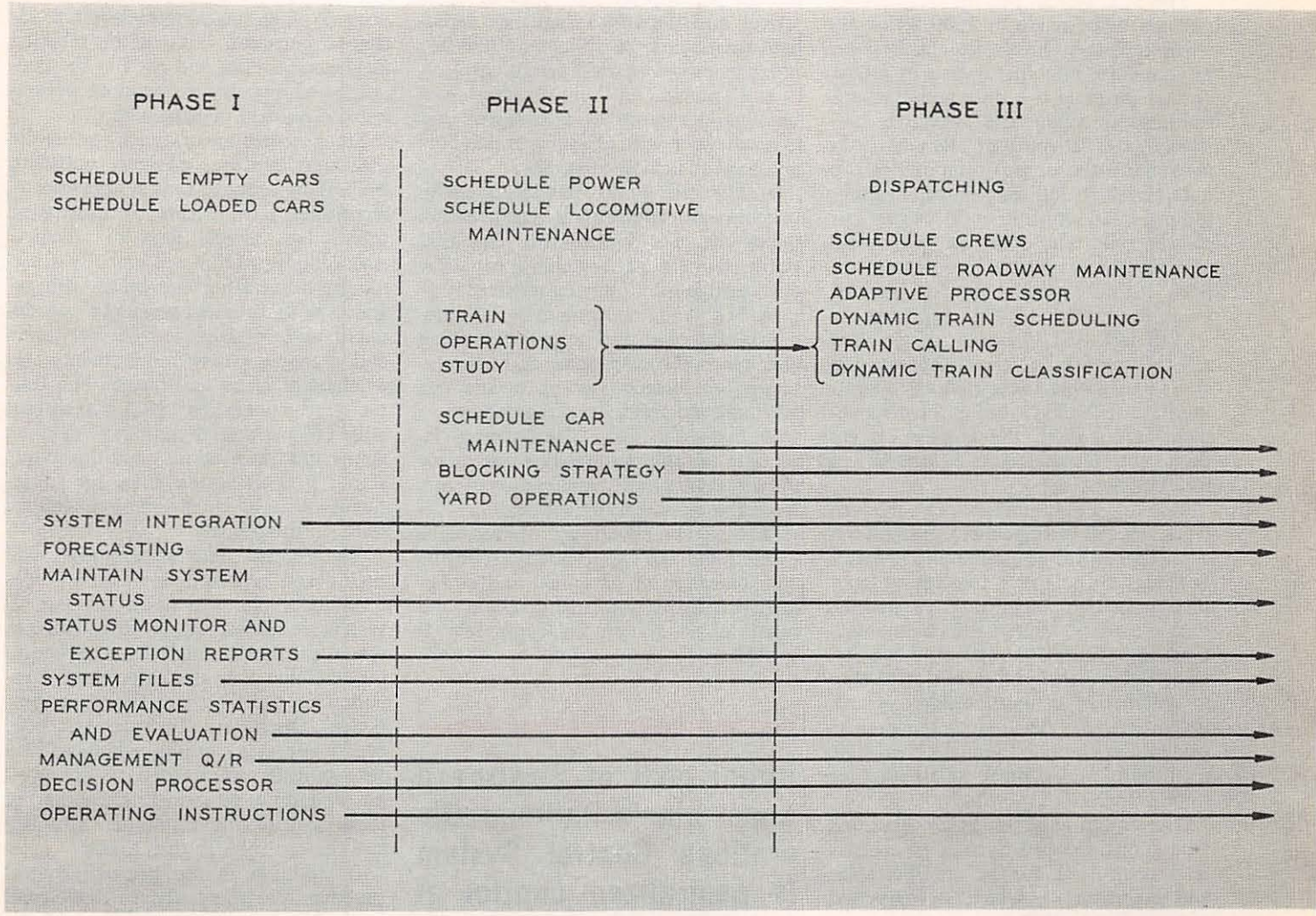
ing cards and entering them into the system at the first 1050 terminal passed. If the train hauling a car does not pass through a 1050-equipped location, waybills and car handling reports are forwarded by connecting train to a 1050 terminal for keypunching and entering into the system. The basic waybill data covering all carload shipments received from connections or originating on our line is punched into detail cards at SCL's agencies and yards. These cards are placed into the card reader with a header card showing time, date, move code, etc., and when the computer next polls the terminal (polling is done every one and one-half seconds), the cards are read and data transmitted to the central computer. After transmission, cards are placed in a card rack pending departure of cars in trains.

When a train is ready to depart, cards are pulled and placed in the order in which cars stand in the train and transmitted to the central computer. There is at least one detail card for every locomotive, car, trailer, container and caboose. A header card containing the from and to station of the train, train number, time, day and month of departure precedes the detail cards and an "end of train" card signifies the end of the consist.

In addition to processing information received, the computer transmits consists to terminal or terminals addressed, thereby providing those terminals with an advance train consist and a duplicate deck of cards. This enables receiving terminals to plan their work prior to arrival of the train.

Yard forces at the receiving terminal hold the consist deck of cards until the train arrives, at which time cards are used for further reporting as needed. If no pick-ups or set-offs were made, the train's arrival is reported to the computer by header card only. If pick-ups and/or set-offs were made, the header card is followed by sub-header cards and detail cards describing cars set-off or picked-up.

In the computer, the on-line disk



RAILROAD OPERATIONS CONTROL SYSTEM project is in three phases.

QTAM Queue File holds incoming and outgoing messages in card image form. Messages are serviced on a first-in first out (FIFO) basis. Messages for a remote terminal which is temporarily down are held for two hours, then dumped via an in-house terminal. When the remote terminal comes back up, the message cards are placed in the in-house 1050 and transmitted to the remote terminal via the computer.

The on-line disk Station Audit Master File is a file of the approximately 75,000 freight stations on all railroads in the United States. The file is index sequential and is keyed by station audit number within the billing railroad number. This file is used to obtain correct spelling of city and state when needed for output information.

The on-line disk Equipment Master File is a list of all USA, Canadian and Mexican equipment: locomotives, cabooses, cars, trailers and containers. Over, 1,800,000 cars are represented. Each record contains the car's reporting initials, number, type, per-diem rate and owner's initials. The file is updated monthly and is used to edit or check car moves reported into the system as a result of zone or interchange moves.

The on-line disk Move Suspense File temporarily stores outbound train consists and associates with each car the appropriate train number. Subsequently, when a header card is received by the computer showing the train has arrived at its next destination, the computer is able to update its Last Move File for cars in its consist.

Information from the detail cards is used by the computer to update the Last Move File. A record in this file contains the last three moves made by a car, its last two interchange receipts, its last delivery and related information. The Last Move File maintains a permanent record for each of SCL's 64,000 system-owned cars, cabooses and locomotives. Also, dynamic records are maintained on approximately 60,000 foreign and privately-owned cars. The latter records are purged weekly—a car record being deleted if the car was delivered in interchange seven or more days ago.

On inquiry from remote terminals, the following information can be obtained from this move file: (1) Last move; (2) Last three moves; (3) Last two receipts; (4) Last waybill information; and (5) Last special instructions or route card.

A log tape file maintains a record of all messages processed by the computer's message processing programs. Every 24 hours the log tape files are sorted by car number and used to obtain the Last Move File, Complete Last Move File and a Loading Report File. The Last Move File records the last SCL car move. Foreign car records are purged from this file every 45 days. The complete Last Move File lists all car moves on SCL lines within the last one and a half months. The Loading Report File lists daily loading of newly loaded cars by commodity.

The SCL system permits on-line corrections to be made at 1050 terminals when necessary. Numerous checks were programmed into the system to guard against errors at the time messages are transmitted. While the system is primarily used to transmit advance train consists via the central computer to the next terminal and answer car location inquiries, administrative messages can also be sent. The data base was made as complete as possible in order to support future applications in various areas, particularly freight operations.

Although SCL was one of the first railroads to install a large teleprocessing system to gather basic railroad operating data such as waybill and car movement information, the current system does not provide actual *control* of freight operations.

Recent developments in modern techniques of management science such as mathematical programming, network analysis, and adaptive forecasting, coupled with equipment such as sensors, data recorders, high speed communications and control computers have led us to believe that the next logical step in automation is now feasible. Accordingly, SCL has decided to broaden its present system to include real-time monitoring and control capabilities for freight operations.

The initial goal of SCL's Railroad Operations Control System is centralized control of freight transportation and maintenance, which is comprised of the following functions:

- Schedule Empty Cars—determine an appropriate sequence of trains for the movement of available empty cars in accordance with system and AAR instructions and shipper requirements.
- Schedule Loaded Cars—determine an appropriate sequence of trains for the movement of loaded cars from their origin to their destination.
- Schedule Power—determine an appropriate allocation of power in accordance with schedule, tonnage, and maintenance requirements.
- Schedule Crews—select operating crews in accordance with work contract regulations, availability, and assignments.
- Dispatching—control of trains on main and branch lines.
- Yard Operations Control Systems Interface—provide local yard control systems with data on anticipated train arrivals and car move requirements.
- Train Calling—determine whether or not to operate a scheduled or extra train in accordance with the availability of traffic, power, crew, and main line.
- Dynamic Train Scheduling—determine an appropriate series of train arrival and departure times in accordance with railroad system status (e.g., traffic connections, yard conditions).
- Dynamic Blocking Strategy—determine an appropriate blocking of cars in accordance with changing traffic flow and yard switching capability.
- Dynamic Train Classification—determine an appropriate classification policy in accordance with changing traffic flow, yard switching capacity, and feasible train interconnections.
- Schedule Locomotive Maintenance—determine an appropriate time and place for inspection and maintenance of locomotives in accordance with railroad and federal regulations.
- Schedule Car Maintenance—determine an appropriate time and place for inspection and maintenance of cars in accordance with regulations.
- Schedule Roadway Maintenance—determine an appropriate schedule and allocation of personnel and equipment for inspection, maintenance, and repair of all system track and related facilities.

Initial goal of Seaboard Coast Line's Railroad Operations Control System is centralized control of freight transportation and maintenance.

The basic control loop of ROCS cycles as follows: Railroad System Activities are encoded, punched into cards, and transmitted via remotely located data terminals to the central ROCS computer. Typical activities or events include car moves augmented by occurrences such as entry of rolling equipment to or exit from maintenance or cleaning, receipt of empty car orders from shippers, or change in status of significant facilities (e.g., yards, main and branch lines, communications systems). By suitable processing of this activity information, the control system will be able to maintain the current status of the railroad in its files. Included in these System Status Files will be data describing the location of trains, condition of yards, availability of and demand for empty cars, power and crews, equipment in maintenance, location and destination of loaded cars, etc. System status information will be purged when no longer required for control purposes, but will be retained in Historical Files and used in the generation of reports for operating personnel and railroad management.

Since freight transit times are usually measured in days, efficient control of traffic flow requires that system control algorithms have access to anticipated traffic data several days in advance. Accordingly, ROCS will embody a significant forecasting capability with respect to items such as empty car demand and releases, loaded car traffic and tonnage, power requirements and availability, main and branch line traffic, yard congestion, etc. Forecasting will be performed utilizing data in status and historical files and the results stored in Forecasting Files for subsequent retrieval by the various control function programs.

The control function programs will be invoked in accordance with a predetermined cycle time or in response to system demands, e.g., a bridge collapse would precipitate immediate rescheduling of traffic over alternate routes. Execution of these control functions generates Operating Instructions, e.g., empty car move orders, which will be automatically transmitted to appropriate operating personnel. Execution of these instructions results in activities and the control loop thus closes.

In addition to the primary control functions described above, ROCS will be designed to provide a variety of significant auxiliary functions which will enhance its value and convenience to operating personnel and provide a suitable degree of manual intervention and "fine-tuning". Briefly, these functions include:

- Performance Statistics—generation of reports required by operating personnel and management.
- Performance Evaluation—computer assessment of performance statistics.
- Adaptive Processor—automated alteration of control function algorithms to achieve improved system performance.
- Status Monitor—continuous monitoring and assessment of railroad system status.
- Exception Reports—special reports to railroad management describing serious or unusual departures from anticipated system operation or activity.
- Query/Response—management facility to interrogate the status of operation of the railroad system.
- Decision Processor—management facility to allow a necessary degree of control over ROCS operation.

You can shop by postcard in

Railway System Controls

HELP YOURSELF . . . to the wide variety of manufacturers' literature shown on the preceding pages. You don't have to write, just circle the numbers on the card below. Then drop the card in the mail (no stamp needed). Railway System Controls will forward your request to each manufacturer and he'll send you complete data free of charge. So . . . get out your pencil and help yourself.

RAILWAY SYSTEM CONTROLS • Reader Service Card

THIS COUPON SERVICEABLE FOR 90 DAYS AFTER DATE OF THIS ISSUE

Circle numbers for more information about products and services.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
24	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
47	**48**	**49**	**50**	**51**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**
119	**120**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**	**141**
142	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**	**160**				

NAME .....

TITLE .....

RAILROAD .....

ADDRESS .....

CITY ..... STATE ..... ZIP # .....

Reader Service Card

Help yourself to information about products, literature and supplies in the signaling, controls and communications areas. Fill out the other side of the card below, tear it out and mail. It's your Railway System Controls shopping guide.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

First Class Permit No. 31775, Chicago, Illinois

RAILWAY SYSTEM CONTROLS

29 EAST MADISON STREET

CHICAGO, ILLINOIS 60602

ATTN: R. W. McKNIGHT

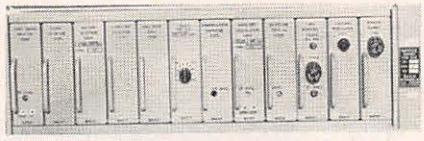
Product News

Remote control system has portable unit (101)

The GENERAIL system for remotely controlling the operation of power switches, warehouse doors, grade crossing signals and gates—or any other device requiring two-position control, consists of a portable transmitter, a wayside receiving coil, and a control module.

When the operator presses his transmitter rocker switch to normal, the transmitter sends a 92-KHz signal. Conversely, when he presses the rocker switch to reverse, the transmitter sends a 110 KHz signal. Because of its limited power and range, no FCC or other licensing is required. Transmitter range is purposely limited to 12 ft and it transmits directionally down.

The epoxy-encapsulated wayside receiving coil can be located anywhere up to 400 ft ahead of the equipment to be operated. Up to four coils can be used for one device. The control module contains solid-state circuitry. Output is a nominal 150-millisecond contact closure for each command. Contacts are rated at 5 amp., 115 volts AC. *General Railway Signal Co.*



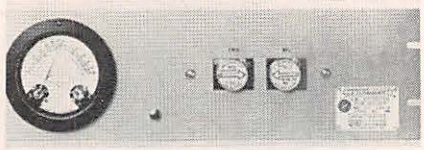
Radio station control is by dispatcher (102)

A waystation radio control system is designed to permit a dispatcher to control a number of wayside radio base stations by tone signaling on the dispatcher's line. This provides direct communications between the dispatcher and the trains operating within his jurisdiction.

By selection of particular two-tone combinations, the dispatcher is able to select any wayside radio base station on the line and then perform all necessary functions to control the radio. The tone signaling is done only in short bursts so that there is no interference with the voice communications on the line.

A summary of the operating features of the system is as follows: (1) Permits selection and control of up to 20 radio base stations on a common party line or voice circuit by a dispatching site. (2) Provides push-to-talk operation by the dispatcher over the voice circuit between the base station and radio mobile. (3) Provides two channel switching of the base station radio, i.e. Channel 1 or Channel 2. (4) Provides automatic revert to Channel 1 when station is selected by the dispatcher. (5) Provides time out (preset 20 to 200 seconds) on push to talk with warning light on time out at dispatcher site.

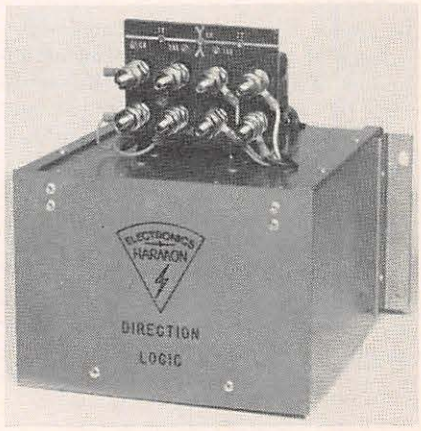
(6) Provides ring back tones from the waystation to the dispatcher and the mobile. Ring back tones coded for station identification. (7) Provision for mobile to signal the dispatcher. Station identified as in (6). (8) Provision is made for operation of a base station radio which is located remote from the waystation drop site. (9) The base station may also be operated by a local operator. (10) Any or all base stations may be operated simultaneously for conferencing. (11) A cancelling or release signal is provided. (12) Each base station may be operated from three lines. The second and third line control facility is optional. *Bayly Engineering Ltd.*



Wattmeter-VSWR meter displays all (103)

The new Thruline model 3122 dual wattmeter-VSWR monitor displays all three measurements at once on a single meter face: Forward and reflected power are indicated by individual pointers and VSWR is monitored on a third scale from the intersection of the two power pointers.

Power and frequency range of the new Bird dual watt-meter VSWR monitor depend on two plug-in elements selected from more than ninety choices available with the popular Thruline model 43: Full scale power levels at ±5% accuracy range from 10 to 10,000 watts for forward indication and 1 to 1000 watts for reflected, in discrete frequency bands from 0.45-2300MHz. *Bird Electronic Corp.*



Crossing logic is solid-state (104)

A new solid state grade crossing logic replaces conventional stick relays. The new unit features fail safe "and" gates and comparitor, light emitting diodes for indicating status of direction logic, interconnections with motion detector, and sold state timer and flasher.

B+ voltage is 10 to 14 volts DC. Input to the solid state logic circuitry is 12 volts DC from audio frequency overlay track circuit receivers and a motion detector. The grade crossing logic outputs 12 volt DC for solid state flasher or conventional relay. *Harmon Electronics Inc.*

Multiplex is for light route microwave (105)

A new 48-channel multiplex communications system is for use on light-route microwave radio transmission facilities. The 36A packages the complete transmit and receive channel functions including E & M signaling and power conversion on a single plug-in module. The 36A uses a low-level transmitted-carrier, single-side-band modulation technique and produces a line frequency spectrum between 12 kHz and 204 kHz. Standard 4-kHz channels may be inserted anywhere within this frequency range to suit any application requirement. Frequency space below 12 kHz may be

(Please turn to page 28)

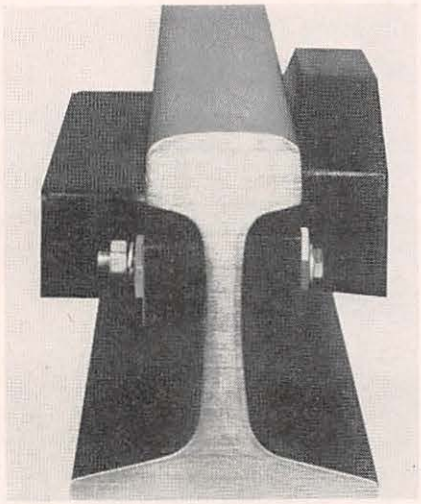
PRODUCT NEWS

(Continued from page 27)

conveniently assigned for order wire voice and alarm transmission.

Another advantage of the 36A design concept is its direct modulation plan to line frequency which provides the most conservative use of bandwidth, since there is no lost frequency spectrum due to intermediate group modulation of channels as is required by other systems. The carrier frequency of each channel is transmitted at low level in the "off-hook" condition for carrier synchronization and signaling. In the "on-hook" condition the channel carrier is suppressed, thereby minimizing loading of the microwave transmission facility.

Each 36A channel unit will operate directly from a −24 volt or a −48 volt battery supply. Fuse failure alarm may be extended to an office alarm system. *GTE-Lenkurt Inc.*



Unit gives wheel count, travel direction (106)

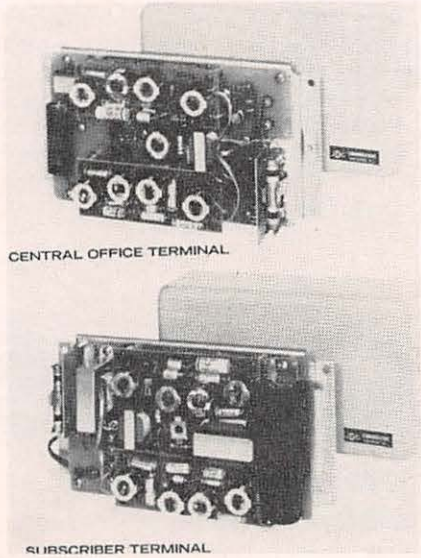
The WD-30D is a directional wheel detector designed for use in systems that require both a wheel count and direction of travel. It will detect wheels on trains traveling from zero to 100 mph.

The WD-30 is a non-directional wheel detector, physically identical with the WD-30D, but it provides wheel detection only. It will detect passage of wheels on trains traveling from zero to 100 mph.

The directional wheel detector uses the principle of eddy current coupling to generate a signal when a wheel is present over the detector head. This detector head is bolted to the web of the rail and connected by 12 ft of cable to wayside electronics in a pedestal mounted weatherproof case. The office logic board is a standard 5″ × 7″ printed circuit board and can be located up to 5000 ft from the wayside electronics. *Signal & Communications Division, WABCO*

Frequency meter has 8 digit readout (107)

A new digital frequency meter, the S-1325A, has 50 millivolt sensitivity and eight digit readout. The unit provides continuous frequency coverage from 50 Hz to 525 MHz in two ranges. The resolution and oscillator stability exceed FCC requirements. Modular integrated circuit design assures simple, reliable operation and ease of maintenance. A built-in deviation meter provides total servicing capability for frequency and FM deviation measurements. *Motorola Communications & Electronics Inc.*



Station carrier can give 8 channels (108)

Type SC-8 multi-channel station carrier system is so designed that no external adjustments or alignments are required. Net loss, ringing voltage and level coordination are automatically controlled. Each channel of the SC-8 system consists of a central office terminal (powered from the central office talking battery) and a subscriber terminal (powered from 115 volts AC). A standby power source is provided in case of power failure. The system uses solid state design throughout, and is designed to provide seven additional channels, 12 KHz frequency spacing, or eight channels, 10 KHz frequency spacing.

The system is completely compatible with other manufacturers' equipment, and can be used on any combination of 19, 22, 24 or 26 gauge two-wire cable facilities. *JDC Communications, Inc.*

• Copolymer coating BONDED to both sides of shielding
• Shield securely BONDED at overlap
• Maximum BONDED shield/jacket combination

Bonded cable is moisture-proof (109)

A bonded communications cable featuring a copolymer coated shield is designed to give positive protection against moisture. Called MPR (Moisture Permeation Resistant), the cable has a copolymer coating on both sides of a corrugated aluminum shield. The shield is laminated to the polyethylene jacket by an exclusive bonding process and is tightly sealed at the overlap to further eliminate moisture permeation. Conventional splicing techniques can be used and cable shields can be bonded and terminated using currently available products.

MPR cable is available in a full range of pair counts and gauges, in single or double jacket, or figure eight construction. Application range includes aerial, duct and direct burial installation. *Anaconda Wire & Cable Co.*

Modem test set is for digital systems (110)

The model 1200 modem test set tests both synchronous and asynchronous modems, multiplexers and digital transmission systems. It features bit or

block error counting, a bias distortion meter, an independent transmitter and receiver data rate capability. Test patterns include those recommended by CCITT, and allow compatibility with Western Electric and other test equipment.

Six selectable patterns are 2047, 511, and 63 bit pseudo-noise sequences and all mark, all space, and alternate mark space. Bias distortion meter measurements facilitate tuning modems. When pseudo-noise patterns are transmitted, the receiver synchronizes itself with the incoming data, utilizing internal clock recovery circuitry, and counts either bits or blocks in error, and displays the error count.

When externally timed for synchronous operation, the model 1200 is capable of half megahertz operation. When internally timed for asynchronous operation, data rates are selectable from 75 through 9600 BPS. The unit is capable of simplex, half duplex, or full duplex operation. *International Data Sciences, Inc.*

Message switching and edp combined (111)

The I-7000 series equipment combines the functions of computerized message switching with on-line data processing. The I-7000 features multiple mini-computers integrated with highly sophisticated and efficient parallel message processing software.

The I-7000 can operate independently as a store-and-forward message switching system to provide computerized control of the transfer of information over a high-speed terminal communications network. It has the capability to add one or more "back-end" computers of any manufacture and to provide immediate on-line access to these computers from any terminal in the network. Standard hardware and software are available to make this interface possible.

All basic I-7000 systems are capable of handling 120 full duplex communications lines, expandable to 960 lines, with up to 15 terminals per multi-drop line. The I-7000 system handles CRT terminals, Teletype units and most other remote terminals on either dedicated or dial-in lines. It can accomodate a mixture of any standard synchronous and asynchronous data sets at speeds from 75 bits per second to 50,000 bits per second. The terminals may operate in half or full duplex mode and may utilize 5, 6, 7 or 8 bit character codes.

Two different models of the I-7000 system are available to provide a sustained total throughput of 5,000 or 10,000 characters per second, and handle a peak load throughput of 10,000 or 20,000 characters per second. *Intelecom, Inc.*

Data comms system has many I/O units (112)

With IBM's new 2770 Data Communication System, one can use a significant variety of input and output devices . . . for printing . . . punched cards . . . paper tape . . . magnetic tape cartridges . . . alphameric visual display . . . magnetic character reading. The 2770 is a dual-purpose terminal system particularly suited for batch processing and inquiry-type use.

The 2770 is designed for use with the IBM 360 model 25 and larger. It transmits data over common-carrier public switched networks and leased or private voice-grade communication lines. Its basic component is the IBM 2772 Multi-Purpose Control Unit. A buffer and keyboard are standard.

In addition to its standard keyboard, the multi-purpose control unit will control an optional printer as well as any two of the following sets of devices: visual display unit, card reader and/or punch, paper tape reader and/or punch, magnetic character reader and two magnetic data inscribers. *IBM Data Processing.*

I/O terminal has 4th generation units (113)

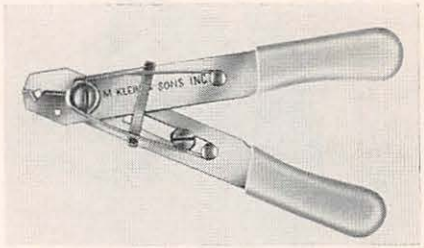
The Novar 5-50 was designed expressly for modern computer teleprocessing systems. Its fourth generation firmware provides interfacing with most of today's computer teleprocessing systems without special programming. It looks like a standard 2740 or 2741 terminal when used in the basic IBM QTAM or BTAM packages. Transmission speeds over standard dial-up telephone lines for sending and receiving data from a computer range from 300 to 2400 baud.

A two tape cartridge system (5-51) is also available, which will permit editing from one tape to the other. One can contain standard formats, computer programs etc. and the other can contain the variable data input. A 10 key numeric input device may also be plugged into either system. *Novar Corp.*

Arrester is for 120 v., 60 Hz power (114)

A secondary lightning arrester is for protection of electrical and electronic equipment on conventional 120 volt, 60 Hz power circuits. Model 1250-01 secondary arrester is a 1-pole, 2-wire device for use on grounded 2 or 3 wire single phase, or grounded 4 wire 3-phase "Y" connected circuits. It is recommended for protection against overvoltages caused by switching surges or lightning discharges.

The new arrester meets or exceeds IEEE 28-USAS C62.1 and NEMA LA-1 Specifications. It functions at lower impulse sparkover and discharge voltages than commonly available arresters; thus, providing better protection for electrical and electronic equipment. High discharge current capacity and power follow current interruption capabilities have been retained. *Joslyn Electronic Systems.*



Wire stripper is only 5" long (115)

A new wire stripper is only 5" long and has a strong spring to hold the jaws open. The cutting knives are extremely hard—C-60 Rockwell.

(Please turn to page 30)

PRODUCT NEWS

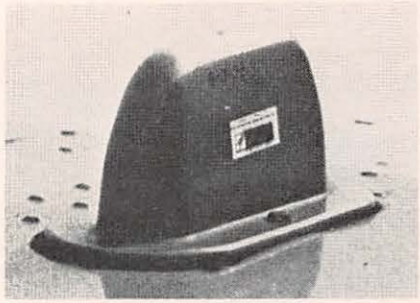
(Continued from page 29)

The stripping notch is precisely machined to remove all burrs which minimizes danger of knicking wire. Handles are yellow plastic dipped and a convenient hole is provided for looping or bending wire. *Mathias Klein & Sons, Inc.*

Ice and snow detector works on 120 volts (116)

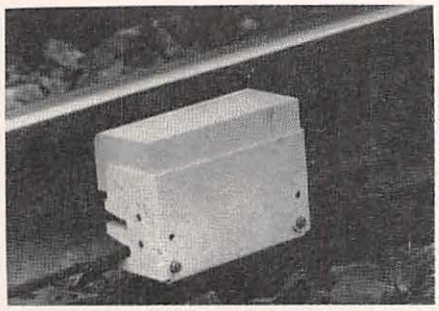
An electronic ice and snow detector operates on 120 volts. A small sensor collects falling or blowing snow and freezing rain or ice and electrically activates heating equipment to activate the thawing process.

The heart of the sensor is a moisture sensing element about the size of a quarter consisting of a conductive wire grid imbedded in glass. The sensing element changes ice and snow to water, producing electrical current leakage which energizes a relay in the system control box. The heating equipment is turned off automatically when the moisture evaporates from the sensing surface. *Cook Electric Co.*



Radio antenna is only 4½" high (117)

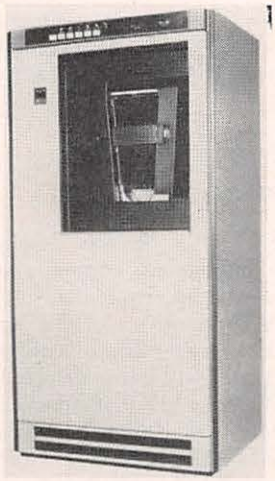
A radical new high-impact-low-profile mobile antenna design is less than 4½" high in the 138-174 MHz VHF models, and less than 3½" high in the 450-470 MHz UHF models. Both models are field tuneable to VSWRs of 1.5:1 or better. When mounted on a horizontal surface, such as a car roof, they radiate an efficient omni-directional pattern which is vertically polarized for compatibility and maximum performance in existing communications networks. *Antenna Specialists.*



Wheel monitor works at 0-125 mph (118)

A wheel monitor signals the presence or passage of a wheel at any speed from zero to 125 mph. The wheel monitor clamps to the rail base and contains a pair of coils producing an AC field of high audio frequency. Any wheel flange disturbing the magnetic field set up by these coils causes an unbalanced voltage that is detected and amplified to provide a signal.

Built to operate from +130°F to −65°F, the wheel monitor will tolerate vibration, water or a direct blow from an out of tolerance flange. It rejects interference from fields due to electrified railways, power lines and other sources. *Abex Corp.*



Memory unit reads 5 cards/sec (119)

The NCR EM-H6 card random access memory unit has a capacity of 145 million, 8-bit characters of information stored on each interchangeable CRAM deck. Each CRAM deck consists of 384 magnetic coated mylar cards, containing a recording density of 1,750 bits per inch. Average access time of the new EM-H6 is 115 milliseconds. The EM-H6 is capable of reading five cards per second. *National Cash Register Co.*

Improved meter has external battery (120)

The improvements incorporated in the new 260 series 6 volt-ohm-milliammeter include an external access battery and fuse compartment; large positive-grip rubber feet which hold the instrument securely on a bench; 0-1 volt DC range; 0-500 volt AC and DC ranges; option 5k-volt safety probe; and multi-purpose, screw-on test leads with combination probe and alligator clips.

The 260-6 requires only two batteries: one 9-volt NEDA 1604 and one 1.5-volt "D" cell NEDA 13F. Rugged taut band movement and varistor overload protection are also standard. Accuracy: DC, ±2% of full scale; AC, ±3% of full scale. *Simpson Electric Co.*

Nickel-cadmium batteries are in 3 ranges (121)

A new complete product line of industrial nickel-cadmium batteries operate within a temperature range of between minus 60°F. and plus 140°F. The new batteries feature a choice of 3 plate types including a unique double-positive steel pocket plate. Capacities of the new Exide industrial nickel-cadmium batteries range from 5 a.h. to 550 a.h. Three cell ranges are low rate, medium rate and high rate.

Low rate Exide nickel-cadmium batteries are designed to supply di-

(Please turn to page 32)

Book

Casebook can aid circuit designers

"Circuit Consultant's Casebook" is written for the circuit designer who encounters difficulties either in conceiving a suitable circuit configuration to meet a required specification or in obtaining optimum performance from a newly designed circuit. The examples given in the book have all occurred frequently in the author's experience. It is a practical guide of value to anyone involved in circuit design work—from theory to actual breadboard performance.

Part 1 is devoted to the discussion of basic design problems, including common errors and their correction. Among the subjects dealt with are: DC conditions, protection, microcircuit usage, dynamic effects, system defects, and errors in testing. Part 2 discusses ways of meeting specification requirements not readily achieved by standard circuits. In certain cases a simple modification to a standard circuit configuration is shown to be sufficient; in others a novel approach is given. Some of the standard circuits for which modified versions are provided include multivibrators, Schmitt triggers, and time interval circuits. Special designs included are meter-driving circuits and precise constant current sources. The text is mostly non-mathematical and can be followed by anyone who has a basic knowledge of circuit design technique.

Circuit Consultant's Casebook by T. K. Hemingway, 1970, TAB Books, Blue Ridge Summit, Pa. 17214, 224 pages. Price: $9.95.

ADVERTISING INDEX

Ansonia Wire & Cable Co. *(Sales Promotion Services, Inc.)* 11

Bayly Engineering Ltd. *(Campbell-Evans Advertising, Ltd.)* 31

Edison Battery Division, McGraw-Edison Co. ...IBC

GTE Lenkurt Inc. *(Hoefer, Dieterich & Brown, Inc.)* 7

The Kerite Company *(O. S. Tyson & Co.)* 18-19

Motorola Communications & Electronics, Inc. *(Perry Brand Advertising)* 4

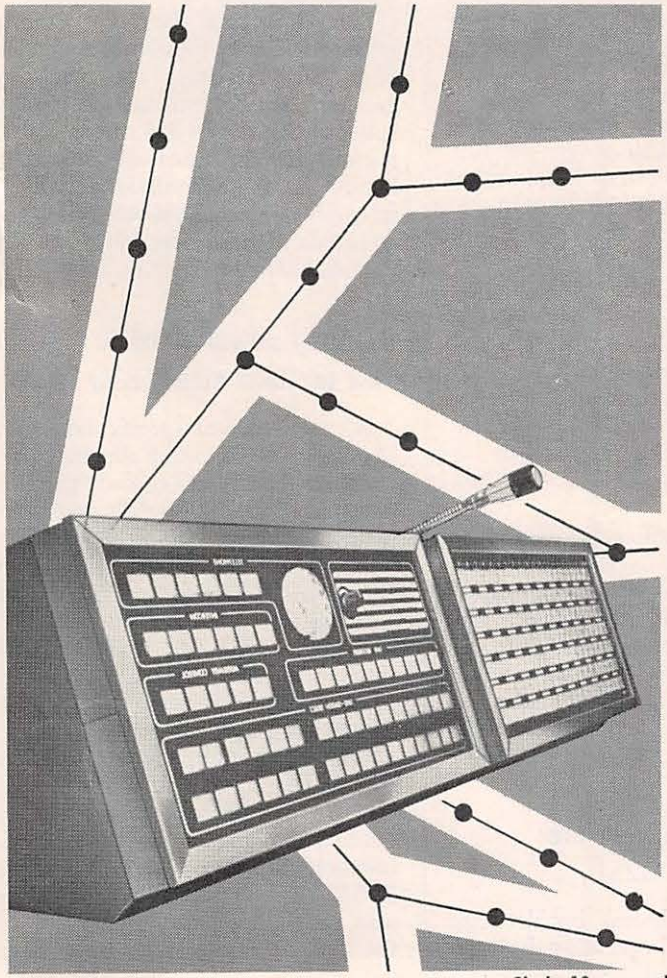
Okonite Company *(Michel-Cather, Inc.)* 3

Railroad Accessories Corp. *(Faber Advertising, Inc.)* .....IFC

Servo Corp. of America *(Industrial Marketing)*.. 17
Sierra Electronic Operation, Philco-Ford Corp. .. 10
Stromberg-Carlson Corp. *(Rumrill-Hoyt, Inc.)* 9

Technical Appliance Co. *(O.A.C., Inc.)* 33

Western-Cullen Division, Federal Sign & Signal Corp. *(Merrill, McEnroe, Fox & Associates, Inc.)* .....BC



CONTROL

consoles are special designs . . . to suit the application.

With BAYLY Tone Signaling and Control Systems, the engineering is custom throughout. Whether it be Train to Wayside Radio, Train Dispatching, Message Line Signaling, Public Address or any other of the specialized requirements . . . the wide range of rugged and dependable BAYLY components assures flexibility and system security.

For complete information . . .

BAYLY ENGINEERING LIMITED *Communication Systems and Components*

AEG a member of the AEG-TELEFUNKEN group

120 HUNT STREET, AJAX, ONTARIO, CANADA
TELEPHONE 416-942-1020 • TELEX 06-981293

Circle 10 on reader service card

PRODUCT NEWS

(Continued from page 30)

rect-current power for three hours or longer. Medium rate batteries in the new line equipped with the unique double-positive plates, are intended to power loads for between 30 minutes and three hours, with frequent discharging and charging (or cycling). High rate Exide nickel-cadmium batteries are specially designed to meet heavy power demands of short duration, ranging from between one minute to 30 minutes. *Exide Power Systems.*

Compatible carrier has 24 channels (122)

A new B320 "D2/D3" compatible "T" carrier channel bank is a 24-channel, solid-state multiplex system using pulse code modulation (PCM) techniques to provide high quality voice and data with toll grade "T" carrier performance on all classes of switched telephone trunks. The flexible 4-channel system is easily expanded to 96-channels, and provides an economical facility for intertoll "D2" trunks as well as exchange "D3" trunks. Terminals are also equipped with a power supply for operation from a −48 volt DC power source. *Lynch Communication Systems.*

Pulse overlay circuit has 21 channels (123)

Type ED5050 pulse coded overlay track circuit has 21 channels in frequency ranges from 313 Hz to 2706 Hz. This is a digitally coded audio overlay circuit that may be superimposed on tracks without interfering with DC track circuits. Coded pulses with an established 3-4-1 code are transmitted continually through the tracks from a transmitter to a receiver. Any two of a group of available frequencies may be employed. Transmission is in tone bursts, three pulses of frequency #1, four pulses of frequency #2 and one pulse of both frequencies #1 and #2. The code consisting of these tone bursts is repeated continually at a rate of 12 bursts per second.

If the proper code is not transmitted and received continually, after suitably selected time delays of 1 to 1½ to 2 seconds, the system will register the presence of a train or malfunction of transmission or reception equipment. *Railroad Division, Erico Products Inc.*

Data system converts low to high-speed (124)

The ADS-630 accepts low-speed digital information and transmits this data at high speeds over a commercial voice-grade telephone line in either half-mode or full-duplex mode without modification. The ADS-630 accepts up to two high-speed voice-grade lines at the central computer and up to three at any remote sites.

The ADS-630 data distribution system accepts digital data over the full spectrum of low-speed baud rates (normally 75 to 600 baud) and allows simultaneous intermixing of any two. The number of low-speed channels (up to 18) accommodated by this new multiplexer varies with the data rate of the low-speed terminal devices. Low-speed digital data from all terminals is accumulated and transmitted as interleaved bits through any high-speed synchronous modem at rates ranging from 2000 to 9600 bits per second.

A continuous, automatic display of color-coded lights on the ADS-630's front panel provides constant monitoring of internal data, terminal, and telephone line conditions. Critical functions are backed up with audible alarms and provision is made for manual control checks. *American Data Systems*

Low-speed data sets are full-duplex FM (125)

A 24-page technical booklet describes the general operating features of the VA300 line of low speed, Bell-type 103A compatible data sets, which provide full duplex FM transmission of synchronous serial binary data at speeds from 0 to 300 bits-per-second over a switched or direct dial telephone network. *Vadic Corp.*

Software available for digital plotting (126)

New data sheets on software packages for use with the Milgo DPS-7 digital plotting system include both basic and application software. Also included is an engineering drafting package designed to produce detailed drawings on a DPS-7 or similar digital plotter with input easily coded by a draftsman or an engineer using English statements.

Additional software programs described in the new literature include "TRIDEM", a three-dimensional software package in FORTRAN; and "CONTOUR-PLOT", a wide-application contouring program which allows the plotter to produce complex, fully-annotated contour maps at an average of thirty times faster than hand-drawing. *Computer Graphics Corp.*

Electrical specs known for microphones (127)

Microphones for broadcasting, public address, mobile communications, base station, tape recording, general purpose and other communications usages are described, including electrical specifications, in a catalog No. 2620. Handheld as well as microphones mounted on adjustable pedestals or desk mountings are also included. *The Turner Co., Inc.*

Standby power units in 1kw to 10kw sizes (128)

A newly-revised specification sheet (A-398) describes and illustrates the complete line of air-cooled, gasoline-powered, portable electric generating plants in sizes ranging from 1,000 watts, AC to 10,000 watts, AC. One DC model is offered in a 1,500 watt, 115-volt size range. All models listed are stated as being complete, and ready to run, with conveniently mounted outlet receptacles providing instant plug-in electric power for operating flood-lights, electric tools and communication equipment.

A representative model selection guide is included which gives model number, capacity, electrical output, RPM, and approximate dimensions and weight for each generator set listed. *Onan Div. of Studebaker Corp.*

NEWS BRIEFS

(Continued from page 8)

planning to spend $8,824 for electrification, $126,831 for signaling and $2,955 for communications. Also, another $46,230 will be spent for elimination of unguarded level crossings (highway-railroad) by installation of automatic equipment.

Sabah State Railways in Malaysia is planning to spend $38,400 in 1971 as follows: communications–$32,000 and level crossing protection–$6,400.

Two major railroads in Mexico are planning to spend $9,785,817 in the coming year. Chihuahua-Pacific Railway has budgeted $8,010 for signaling and $16,020 for communications. Mexican National Railways is budgeting $9,761,787 as follows: electrification–$990,837; signaling–$2,803,500 and communications–$1,722,150. Crossing protection devices and other safety equipment will be covered in another expenditure of $4,245,300 in the 1971 budget.

Mozambique State Railways is planning to spend $5,280,000 for signaling projects during 1971.

Netherlands Railways are budgetting $5,454,900 for system controls during this year. $688,750 will be for electrification, $3,801,900 will be for signal projects and $964,250 will be spent for communications facilities.

The New Zealand Government Railways are planning to spend $145,600 for electrification and $642,880 on signaling and communications projects.

Nigerian Railway Corp. will spend $511,025 for signaling projects and $147,459 for communications projects during 1971.

The Northern Ireland Railway is planning to spend $121,200 for signaling facilities this year.

The Norwegian State Railways system controls budget totals $5,829,660 for 1971. Electrification projects will take $2,222,280; signal projects are budgeted at $2,935,800 and communications expenditures in the capital area total $671,040.

The Peruvian Corp. is planning to spend $32,000 for communications during the coming year on capital projects.

Philippine National Railways has budgeted $950,000 for capital expenditures in the signal and communciations area for 1971.

Portugese Railways is budgeting $968,000 for capital expenditures in three control areas in 1971, as follows: electrification–$100,320; signaling–$626,560; and communications–$241,120.

In Saudi-Arabia, the Saudi Government Railway is planning to spend $20,830 for signaling at level crossings.

South African Railways total controls budget is set at $33,087,320 for 1971. $6,906,760 will be spent on electrification projects. Communications facilities improvements are budgeted at $10,364,200, and signaling expenditures amount to $9,760,380. Another $6,055,980 will be spent for crossings and signs.

Railways in Spain are budgeting $19,791,200 in the system controls area for capital expesditures during 1971. Catalanes Railways will spend $314,600 for signal projects and $85,800 for communications projects. Spanish National Railways is budgeting $7,779,200 for electrification, $9,166,300 for signaling projects and $2,445,300 for communications in the coming year.

Three railways in Sweden are planning to spend $12,415,826 during 1971 for capital projects in the system controls area. Nora Bergslag Railway will spend $9,665 for signal work and $15,531 on communications projects. Storstockholms Lokaltrafik has budgeted $135,310 for electrification projects, $173,970 for signal projects and $270,720 for communications facilities. Swedish State Railways total of $11,810,630 for system controls capital expenditures is as follows: electrification (renewals and rebuilding only)–$4,503,890; signaling –$5,199,770; and communications–$2,106,970.

Three railroads in Switzerland are planning to spend $6,445,637 in the system controls area during 1971. Brig-Visp-Zermatt Railway is planning to spend $94,040 on major track improvements of 41.10 km ("Kalter Boden" crossing points). $23,510 will be spent on electrification projects; and $58,775 on signal projects. Rhatische Bahn has budgeted a total of $791,482 in the system controls area, as follows: electrification–$211,590; signaling–$259,786; communications–$203,732; and automatic barriers at highway-railroad grade crossings–$116,374. Swiss Federal Railways is budgeting $5,477,830 as follows: signaling and safety installations–$3,691,070; and communications–$1,786,760.

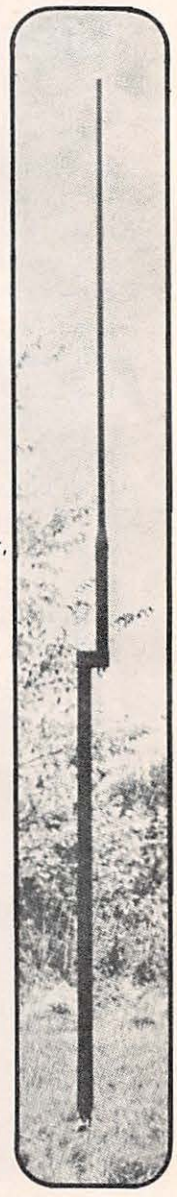
Thailand State Railways is planning to spend $76,154 on signal projects during 1971.

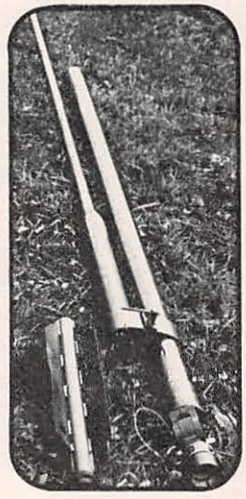
Position Wanted
Comm. and Sig. Engr.
Experienced resume available
H. PFEIFFER
52 Scotch Pine Dr.
Voorheesville, N.Y. 12186

TALK SOFTLY - AND CARRY OUR LITTLE STICK

TACO presents Muldipol TM*, a very unique omnidirectional UHF/VHF multiple dipole collinear array for your ground-air-ground, air traffic control and mobile base applications. It looks innocent enough, but gives formidable performance in a simplistic and easily transportable package. The Muldipol TM* design offers isolation between discrete channels of up to 40 dB (for talking softly without crosstalk) with a radiating element spacing average of one every 39 inches of vertical height! Elements may be stacked for increased gain and mixed with any combination of single or stacked UHF or VHF elements within a given array. Muldipol TM* arrays may be self-supporting, mounted on a tower, building or vehicle. Shown is the 3-channel Model D-2018, designed and built for the USAF AN/TPN-19 system.

* (pat. pend.)





CREATING PATTERNS FOR PROGRESS IN COMMUNICATIONS

GENERAL INSTRUMENT CORP.
TACO DIVISION

1 TACO ST., SHERBURNE, N.Y. 13460

Circle 11 on reader service card

Editor's Corner

Signaling doesn't cost, it pays its way

In the March 29 issue of *Railway Age*, Penn Central President William H. Moore, said: "I strongly question the need for three and four tracks all the way from here [Philadelphia] to Pittsburgh. We have a study going on right now to put in CTC between here and Pittsburgh, and also between New York and Washington. The resulting economies would pay for this CTC program in pretty quick order. We have block operators every 8 or 10 miles from New York to Washington, with each one controlling just his bailiwick. I see no reason why every bit of this could not be done from Philadelphia."

The savings, which Mr. Moore did not specify, would undoubtedly come from eliminating block operators, reduced track maintenance expense, improved running times providing better service, and in greater motive power utilization.

Some railroad managers have been minimizing their signal programs because, as they put it, "we need the money for cars and locomotives. We need more cars because of the car shortage and because they bring in revenue." These men, unfortunately, look upon signaling as a necessary expense to improve safety of operations. But signaling does pay for itself as past experience has shown.

A survey of almost any railroad's physical plant will turn up locations where modernized or new signaling could reduce present operating costs and improve service. For example, at how many yard entrances are switch tenders employed, or must trains be stopped for crews to hand-throw switches? Remote control of these switches—from the yardmaster's office—could reduce manpower and train stops. Stopping a train takes time and costs money—wear on brake shoes and fuel for restarting the train.

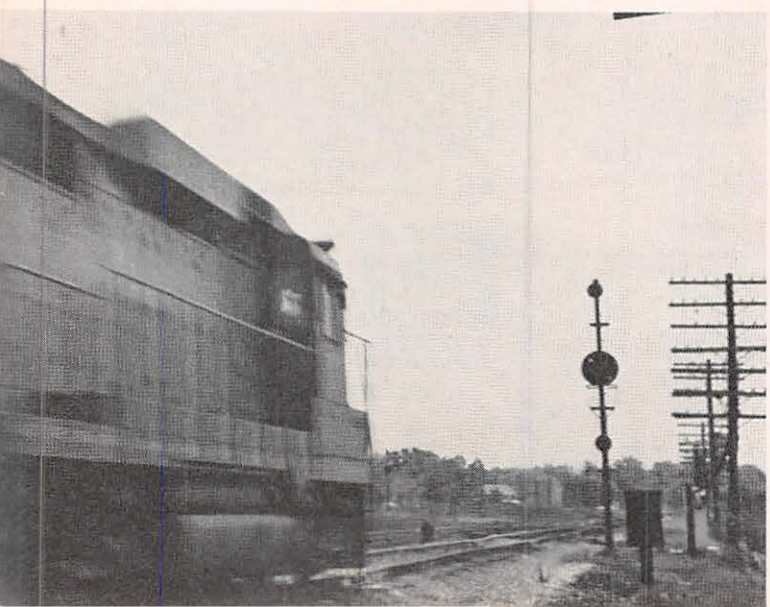
How many attended interlockings are there that could be remotely controlled from other locations? How many crossings of two or more railroads now controlled by attended interlockings could be automated thereby eliminating the operators? If the interlocking is attended because it is a train-order point, could the train order function be moved to another open office such as a yard thus permitting the interlocking to be automated or remotely controlled?

Classification yard automation, while carrying a rather large initial price tag does provide operating savings. For example, one railroad made detailed studies of loss and damage at one of its major yards before and after the control system was automated. Annual loss and damage payments at the yard were reduced by about $1 million following yard automation. Another railroad estimated that with car time reduced by at least 50% at a newly automated classification yard, savings in per diem amounted to $1 million or more per year.

Other questions that can be asked about signal facilities concern centralized traffic control. For example, has any study been made to determine siding usage? Are there little-used sidings that could be removed? Checking the connection times at terminals may allow for schedule alterations to change meeting points so that greater utilization of some sidings can be obtained with elimination of other sidings.

Where double track exists, some railroads have found that installing CTC with alternate sections of single track (10 miles) and double track (5 miles) provides for a smoother flow of traffic. The double-track sections have intermediate crossovers to provide flexibility for passing faster trains around slower ones and the making of non-stop meets. Here again, reduced track maintenance results from removing portions of double-track mains.

The railroad signal plant must be continually evaluated in light of changing operating, economic and technical conditions. Changes often have to be made in the signal plant to provide for the most efficient operation. Now, when money is relatively scarce, is a good time to re-evaluate the signal plant and determine where new economies and improvements can be made. Signaling pays for itself through reduced costs and improved efficiency in operations.



They tell us a good ad should say only one thing—the most important thing—about a product. So here goes . . .

The Product:

EDISON NICKEL-CADMIUM STORAGE BATTERIES

The Most Important Thing:

PERFORMANCE

End of Advertisement

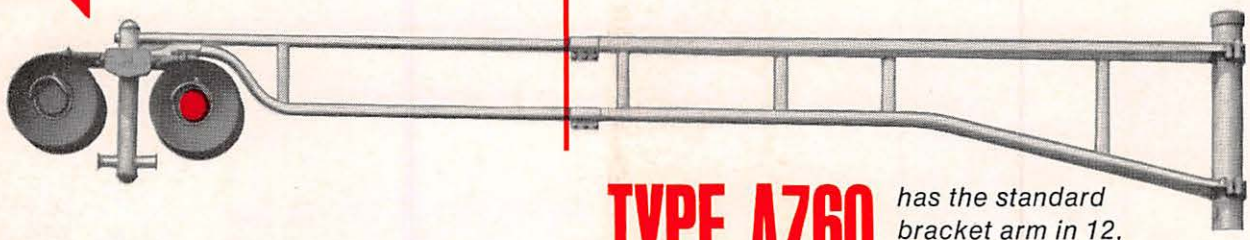
. . . brought to you by the Edison Battery Division, McGraw-Edison Company, P.O. Box 28, Bloomfield, N. J. 07003 who will be glad to send you a catalog full of details, if you would like to have them. Just write the address above.

Circle 5 on reader service card

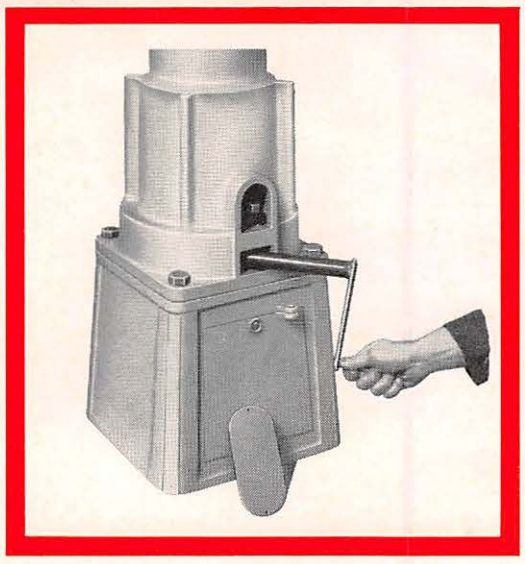
YES, WESTERN-CULLEN ROTATABLE ALUMINUM CANTILEVERS ARE BASICALLY THE SAME!

Only in the Bracket Arm is there a Difference.

TYPE A770 *has the telescopic bracket arm, adjustable to any length between 15 and 20 feet.*



TYPE A760 *has the standard bracket arm in 12, 15 or 20 foot lengths.*



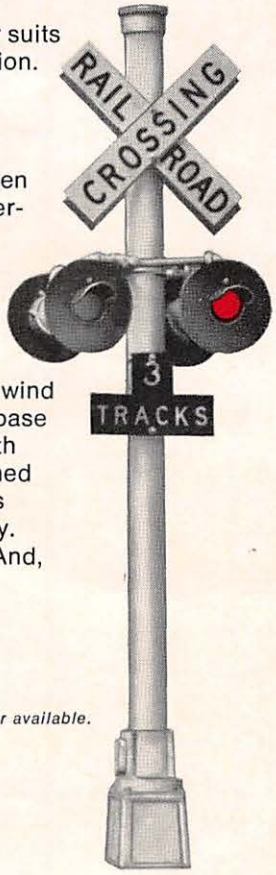
As you know, the standard bracket arm with the Western-Cullen Type A760 Cantilever generally suits most requirements precisely "to a T." No question.

The *telescopic* bracket arm with our Type A770 Cantilever, however, is specifically designed to provide adaptability for crossings that require intermediate lengths of arms—anywhere between 15 and 20 feet. Telescopic arms are ideal, furthermore, for use at crossings where there is likelihood of future widening of the highway.

Other than that, both types of Western-Cullen Cantilevers have the same basic features to assure overall enduring performance.

Examples: They are built to withstand 100 MPH wind pressure; with 17 foot road clearance. Safe, at-base releasing and revolving of the bracket arm—with automatic, positive locking when the arm is turned off-highway. Throughout servicing, indication is maintained, as the main mast remains stationary. You know, too, anodized aluminum is durable. And, to top it off, these units are easier to install and maintain.

In fact, Western-Cullen has a cantilever to meet your every need. The choice is yours!



Aluminum hook-on ladder available.

Write to us for Bulletin: C.P.b. 1/71

WESTERN-CULLEN DIVISION

FEDERAL SIGN & SIGNAL CORPORATION

"THE FUTURISTS"

2700 West 36th Place • Chicago, Illinois 60632

Canada: Woodings Canada, Ltd., 5 Place Ville Marie, Montreal 113, Que.

5859

Circle 3 on reader service card